SPX®

INSTRUCTION MANUAL

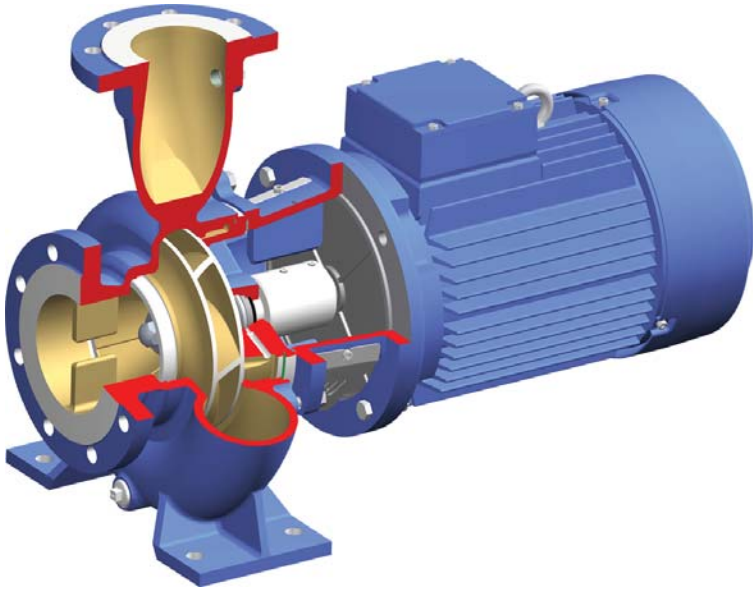
CombiBloc

Horizontal centrifugal monobloc pump

CB/EN (1501) 6.6

Orginal instructions

Read and understand this manual prior to operating or servicing this product



Johnson Pump®

EC Declaration of conformity

(Directive 2006/42/EC, appendix II-A)

Manufacturer

SPX Flow Technology Assen B.V.
Dr. A.F. Philipsweg 51
9403 AD Assen
The Netherlands

hereby declares that all pumps member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiLine, CombiLineBloc and CombiNorm whether delivered without drive (last position of serial number = B), or delivered as an assembly with drive (last position of serial number = A), are in conformity with the provisions of Directive 2006/42/EC (as altered most recently) and where applicable the following directives and standards:

- EC directive 2006/95/EC, "Electric equipment for use within certain voltage limits"
- standards EN-ISO 12100 part 1 & 2, EN 809

The pumps to which this declaration refers may only be put into operation after they have been installed in the way prescribed by the manufacturer, and, as the case may be, after the complete system of which these pumps form part, has been made to fulfil the requirements of Directive 2006/42/EC (as altered most recently).

EC Declaration of conformity

(Directive 2009/125/EC, Annex VI and Commission Regulation (EU) No 547/2012)
(Implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water pumps)

Manufacturer

SPX Flow Technology Assen B.V.
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The Netherlands

Hereby declares that all listed pumps member of product families CombiBloc, CombiBlocHorti, CombiChem, CombiLine, CombiLineBloc and CombiNorm are in conformity with the provisions of Directive 2009/125/EC and Commission Regulation (EU) No 547/2012 and the following standard:

- prEN 16480

Declaration of incorporation

(Directive 2006/42/EC, appendix II-B)

Manufacturer

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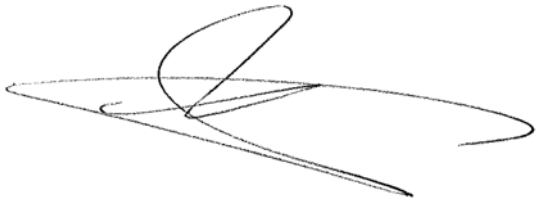
The Netherlands

hereby declares that the partly completed pump (Back-Pull-Out unit), member of productfamilies CombiBloc, CombiBlocHorti, CombiChem, CombiLine, CombiLineBloc and CombiNorm is in conformity with the following standards:

- EN-ISO 12100 parts 1 & 2, EN 809

and that this partly completed pump is meant to be incorporated into the specified pump unit and may only be put into use after the complete machine of which the pump under consideration forms part has been made and declared to comply with that directive.

Assen, January 1st 2015



G. Santema,

Ad Interim statutory director

Instruction manual

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SPX is a Fortune 500, global multi-industry manufacturing leader. SPX divides its business into four segments and one of these is the SPX Flow Technology segment. SPX Flow Technology Assen B.V. is part of SPX Flow Technology segment.

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1 Introduction

1.1 Preface

This manual is intended for technicians and maintenance staff and for those who are in charge of ordering spare parts.

This manual contains important and useful information for the proper operation and maintenance of this pump. It also contains important instructions to prevent potential accidents and damage, and to ensure safe and fault-free operation of this pump.

! **Read this manual carefully before commissioning the pump, familiarize yourself with the operation of the pump and strictly obey the instructions!**

The data published here comply with the most recent information at the time of going to press. However they may be subject to later modifications.

SPX reserves the right to change the construction and design of the products at any time without being obliged to change earlier deliveries accordingly.

1.2 Safety

This manual contains instructions for working safely with the pump. Operators and maintenance staff must be familiar with these instructions.
Installation, operation and maintenance has to be done by qualified and well prepared personnel.

Below is a list of the symbols used for those instructions and their meaning:

⚠ ***Personal danger for the user. Strict and prompt observance of the corresponding instruction is imperative!***

! **Risk of damage or poor operation of the pump. Follow the corresponding instruction to avoid this risk.**

➢ *Useful instruction or tip for the user.*

Items which require extra attention are shown in **bold print**.

This manual has been compiled by SPX with the utmost care. Nevertheless SPX cannot guarantee the completeness of this information and therefore assumes no liability for possible deficiencies in this manual. The buyer/user shall at all times be responsible for testing the information and for taking any additional and/or deviating safety measures. SPX reserves the right to change safety instructions.

1.3 Guarantee

SPX shall not be bound to any guarantee other than the guarantee accepted by SPX. In particular, SPX will not assume any liability for explicit and/or implicit guarantees such as but not limited to the marketability and/or suitability of the products supplied.

The guarantee will be cancelled immediately and legally if:

- Service and/or maintenance is not undertaken in strict accordance with the instructions.
- The pump is not installed and operated in accordance with the instructions.
- Necessary repairs are not undertaken by our personnel or are undertaken without our prior written permission.
- Modifications are made to the products supplied without our prior written permission.
- The spare parts used are not original SPX parts.
- Additives or lubricants used are other than those prescribed.
- The products supplied are not used in accordance with their nature and/or purpose.
- The products supplied have been used amateurishly, carelessly, improperly and/or negligently.
- The products supplied become defective due to external circumstances beyond our control.

All parts which are liable to wear are excluded from guarantee. Furthermore, all deliveries are subject to our "General conditions of delivery and payment", which will be forwarded to you free of charge on request.

1.4 Inspection of delivered items

Check the consignment immediately on arrival for damage and conformity with the advice note. In case of damage and/or missing parts, have a report drawn up by the carrier at once.

1.5 Instructions for transport and storage

1.5.1 Dimensions and weight

A pump or a pump unit is generally too heavy to be moved by hand. Therefore, use the correct transport and lifting equipment. Dimensions and weight of the pump or pump unit are shown on the label on the cover of this manual.

1.5.2 Use of pallets

Usually a pump or pump unit is shipped on a pallet. Leave it on the pallet as long as possible to avoid damages and to facilitate possible internal transport.

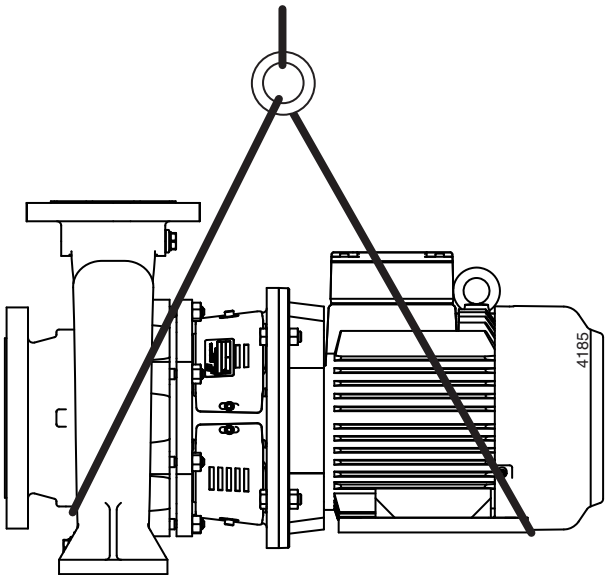
! When using a forklift always set the forks as far apart as possible and lift the package with both forks to prevent it from toppling over! Avoid jolting the pump when moving it!

1.5.3 Hoisting

When hoisting a pump or complete pump units the straps must be fixed in accordance with figure 1.

⚠ ***Never go underneath a hoisted pump!***

Figure 1: Lifting instructions.



1.6 Storage

If the pump is not to be used immediately the stub shaft must be turned by hand twice per week.

1.7 Ordering parts

This manual contains a survey of the spare parts recommended by SPX as well as the instructions for ordering them. A fax-order form is included in this manual.

You should always state all data stamped on the type plate when ordering parts and in any other correspondence regarding the pump.

➢ *This data is also printed on the label on the front of this manual.*

If you have any questions or require further information with regard to specific subjects, then do not hesitate to contact SPX.

2 General

2.1 Pump description

The CombiBloc is a range of horizontal non-self-priming centrifugal pumps. The pump and the standard IEC flange motor are assembled by means of a lantern piece and a stub shaft to one complete unit. The pumps are available in cast iron, bronze and stainless steel. The cast iron and bronze pump casings comply with EN 733 (DIN 24255), the stainless steel pump casings comply with EN 22858 / ISO 2858 (DIN 24256).

2.2 Type code

Pumps are available in various designs. The main characteristics of the pump are shown in the type code.

Example: **CB 40-200 G2**

Pump family	
CB	**C**ombi**B**loc
Pump size	
40	diameter discharge connection [mm]
200	nominal impeller diameter [mm]
Pump casing material	
G	cast iron
B	bronze
R	stainless steel
Impeller material	
1	cast iron
2	bronze
6	stainless steel

2.3 Serial number

Serial number of the pump or pump unit are shown on the name plate off the pump and on the label on the cover of this manual.

Example: **01-1000675A**

01	year of manufacture
100067	unique number
5	number of pumps
A	pump with motor
B	pump with free shaft end

Example horticulture: **11-09 X123500 1/2**

11-09	month-year of manufacture
X123500	unique number
1/2	number of pumps

2.4 Applications

- In general, this pump can be used for thin, clean or slightly polluted liquids. These liquids should not affect the pump materials.
- Further details about the application possibilities of your specific pump are mentioned in the order confirmation and/or in the data sheet enclosed with the delivery.
- Do not use the pump for purposes other than those for which it is delivered without prior consultation with your supplier.

⚠ ***Using a pump in a system or under system conditions (liquid, working pressure, temperature, etc.) for which it has not been designed may hazard the user!***

2.5 Construction

2.5.1 Design

The design is characterized by a compact construction. The pump is mounted to a standard IEC flange motor by means of a lantern piece and stub shaft. The pump cover is clamped between the pump casing and the lantern piece.

The electric motors up to and including frame size 112M have B5 mounting arrangement and the larger types have B3/B5 mounting arrangement. All vertically placed motors have mounting arrangement V1.

For each individual pump type there is only one construction of pump casing and impeller. The pumps are available in cast iron, bronze and stainless steel. The cast iron and bronze pump casings are according to EN 733 (DIN 24255) and the stainless steel pump casings according to EN 22858 / ISO 2858 (DIN 24256). The stub shaft is made of stainless steel.

2.5.2 Mechanical seal

The pump is provided with a mechanical seal with mounting dimensions according to EN 12756 (L_{1K}) (DIN 24960 (L_{1K})).

Only 3 diameters are used for the whole range: d1 = 30 mm, 40 mm or 50 mm.

2.5.3 Bearing construction

The pump shaft bearing is provided by the motor bearings. The selection of the pump/motor combination is such that the bearings of the applied electric motors can absorb the axial and radial forces without the bearing life being affected.

The electric motors must be provided with a **fixed bearing**.

2.6 Ecodesign Minimum Efficiency Requirements Water Pumps

- Directive 2005/32/EC of the European Parliament and of the Council;
- Commission regulation (EU) No 547/2012 Implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water pumps.

2.6.1 Introduction

SPX Flow Technology Assen B.V. is an associate member of the HOLLAND PUMP GROUP, an associate member of EUROPUMP, the organization of European pump manufacturers.

Europump promotes the interest of the European pump industry with the European institutions.

Europump welcomes the aim of the European Commission to reduce eco-impact of products in the European Union. Europump is fully aware of the eco-impact of pumps in Europe. For many years the ecopump initiative is one of the strategic columns in the work of Europump. From the first of January 2013 the regulation is coming into force concerning minimum required efficiencies of rotodynamic water pumps. The regulation sets minimum efficiency requirements on water pumps set out under the Ecodesign Directive for energy related products. This regulation mainly addresses manufacturers of water pumps placing these products on the European market. But as a consequence customers may also be affected by this regulation. This document gives necessary information related to the coming into force of the water pump regulation EU 547/2012.

2.6.2 Implementing Directive 2009/125/EC

- Definitions:

"This Regulation establishes eco-design requirements for the placing on the market of rotodynamic water pumps for pumping clean water, including where integrated in other products."
"Water pump" is the hydraulic part of a device that moves clean water by physical or mechanical action and is of one of the following designs:

1 End suction own bearing (ESOB);

2 End suction close coupled (ESCC);

3 End suction close coupled inline (ESCCi);

4 Vertical multistage (MS-V);

5 Submersible multistage (MSS);"

'*End suction water pump*' (ESOB) means a glanded single stage end suction rotodynamic water pump designed for pressures up to 1600 kPa (16 bar), with a specific speed ns between 6 and 80 rpm, a minimum rated flow of 6 m^3/h, a maximum shaft power of 150 kW, a maximum head of 90 m with nominal speed of 1450 rpm and a maximum head of 140 m with nominal speed of 2900 rpm;

'*End suction close coupled water pump*' (ESCC) is an end suction water pump of which the motor shaft is extended to become also the pump shaft;

'*End suction close coupled inline water pump*' (ESCCi) means a water pump of which the water inlet of the pump is on the same axis as the water outlet of the pump;

'*Vertical multistage water pump*' (MS-V) means a glanded multistage (i > 1) rotodynamic water pump in which the impellers are assembled on a vertical rotating shaft, which is designed for pressures up to 2500 kPa (25 bar), with a nominal speed of 2900 rpm and a maximum flow of 100 m^3/h;

'*Submersible multistage water pump*' (MSS) means a multistage (i > 1) rotodynamic water pump with a nominal outer diameter of 4" (10,16 cm) or 6" (15,24 cm) designed to be operated in a borehole at nominal speed of 2900 rpm, at operating temperatures within a range of 0°C and 90°C;

This Regulation shall not apply to:

1 water pumps designed specifically for pumping clean water at temperatures below -10°C or above +120°C;

2 water pumps designed only for fire-fighting applications;

3 displacement water pumps;

4 self-priming water pumps.

- Enforcement:

In order to enforce this there will be a **Minimum Efficiency Index** (M.E.I.) criteria set for the above list of pumps.
The MEI is a dimensionless figure that is derived from a complex calculation based on the efficiencies at BEP (Best Efficiency Point), 75% BEP & 110% BEP, and the specific speed. The range is used so that manufacturers do not take an easy option of providing good efficiency at one point i.e. BEP.
The value ranges from 0 to 1,0 with the lower value being less efficient, this provides the basis of eliminating the less efficient pumps starting with 0,10 in 2013 (the lowest 10%) and 0,40 (the lowest 40%) in 2015.
The MEI value of 0,70 is classed benchmark for the most efficient pumps in the market at the time of developing the directive.

The milestones for the MEI values are as follows;

1 1st January 2013 all pumps shall have a minimum MEI value of 0,10;

2 1st January 2015 all pumps shall have a minimum MEI value of 0,40.

The most important point of this is that unless the pumps comply then they will not be allowed to have a CE marking.

- Part Load Performance

It is common practice that pumps spend much of their time working away from their rated duty, and efficiency can fall off rapidly below the 50% duty point, any scheme should take account of this real life performance. However, manufacturers need a pump efficiency classification scheme that makes it impossible to design pumps with a steep fall off in efficiency either side of the BEP point in order to claim a higher efficiency than would be typical of real life operation.

- 'House of Efficiency'

The decision scheme 'House of Efficiency' takes into account design and application purposes as well as the pump minimum efficiency dependence on flow. The minimum acceptable efficiency is therefore different for each pump type. The pass-or-fail scheme is based on two criteria A and B.

Criterion A is the pass-or-fail minimum efficiency requirement at the best efficiency point (BEP) of the pump:

$$\eta_{Pump}\langle n_s, Q_{BEP}\rangle \geq \eta_{BOTTOM}$$

Where

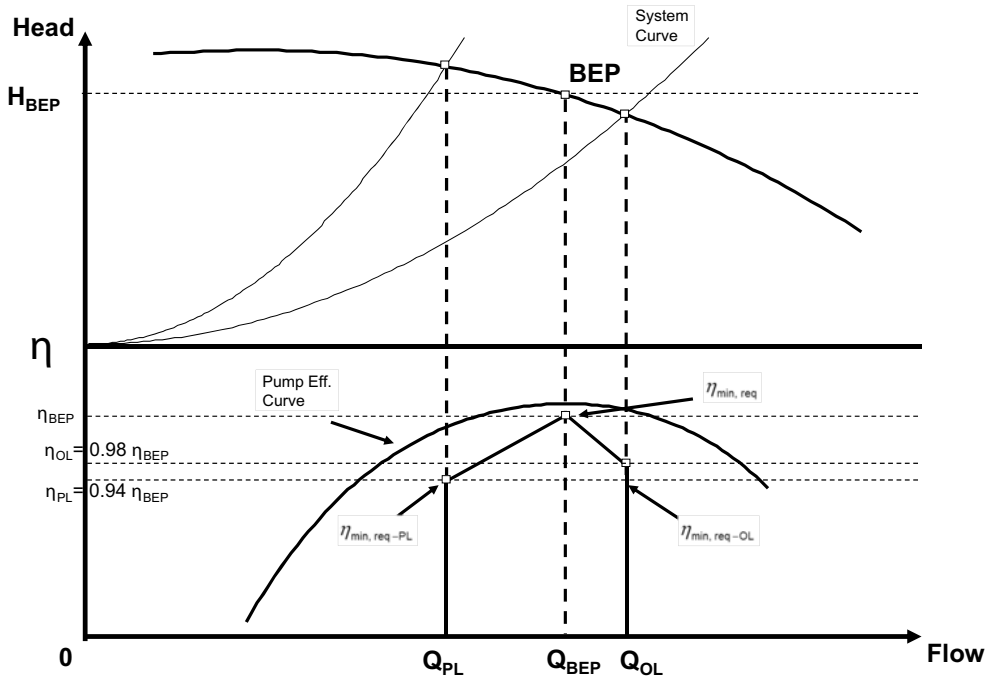
$$n_s = n_N \times \frac{\sqrt{Q_{BEP}}}{H_{BEP}^{0.75}}$$

Criterion B is the pass-or-fail minimum efficiency requirement at part load (PL) and at overload (OL) of the pump:

$$\eta_{BOTTOM-PL,\,OL} \geq x \cdot \eta_{BOTTOM}$$

Therefore a method is devised what is called a “house of efficiency” scheme that also requires pumps to pass efficiency thresholds at 75% and 110% of rated flow. The advantage of this is that pumps will be penalised for poor efficiency away from rated efficiency, hence it will take account of real life pump duties.
It should be stated that while the scheme may appear complicated at first sight, in practice it has been easy for the manufacturers to apply the scheme to their pumps.

Figure 2: House of Efficiency



2.6.3 Energy Efficient Pump Selection

In selecting the pump, care should be taken to ensure that the duty point required is as close as possible to the pump's Best Efficiency Point (BEP). Different heads and flows can be achieved by changing the diameter of the impeller and thereby eliminating unnecessary energy loss.

The same pump can be offered at different motor speeds to allow the pump to be used over a much wider range of duties. For instance, changing from 4-pole motor to 2-pole motor will enable the same pump to deliver twice as much peak flow at 4 times the head.

Variable speed drives allow the pump to operate efficiently over a wide range of speeds hence duties in an energy efficient manner. They are particularly useful in systems where is a variation in required flow.

A very useful tool for energy efficient pump selection is the downloadable software program "Hydraulic Investigator 2" from the SPX website.

Hydraulic Investigator is the selection guide for centrifugal pumps and search by pump family and pump type starting from entering required capacity and head. Further refine the pump curves to find the pump that meets your specification.

The default setting of applicable pump types is prioritized on highest efficiency. In the standard automated selection procedure the optimum (trimmed) impeller diameter is calculated already, where applicable. Manually the rotating speed can be adjusted as well when a variable speed drive is preferred.

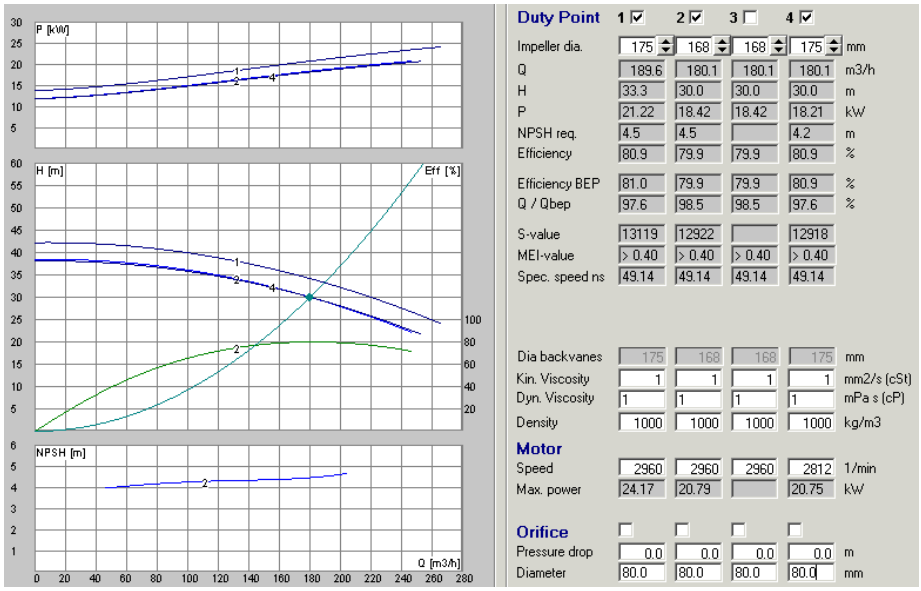
Example:

Curve 1: performance at maximum impeller diameter and 2960 rpm;

Curve 2: performance at required duty point (180 m^3/h, 30 m) with trimmed impeller, power consumption 18,42 kW;

Curve 4: performance at required duty point with maximum impeller diameter and reduced rotating speed (2812 rpm), power consumption 18,21 kW.

Figure 3: Hydraulic Investigator 2



2.6.4 Scope of Implementing Directive 2009/125/EC

The following SPX Flow Technology products are in the scope of the directive:

- CombiNorm (ESOB)
- CombiChem (ESOB)
- CombiBloc (ESCC)
- CombiBlocHorti (ESCC)
- CombiLine (ESCCi)
- CombiLineBloc (ESCCi)

Pumps with half-open impeller are excluded from the scope of the directive. Half-open impellers are designed for pumping liquids containing solids.

The vertical multistage pump range MCV(S) is out of the scope of the directive, these pumps are designed for pressures up to 4000 kPa (40 bar).

Submersible multistage pumps are not available in the SPX product portfolio.

2.6.5 Product information

Name plate, example:

Figure 4: Name plate

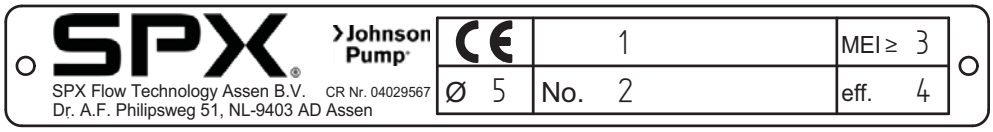


Table 1: Name plate

1	CB 40C-200 G1	Product type and size
2	12-1000675A	Year and serial number
3	0,40	Minimum Efficiency Index at max. impeller diameter
4	[xx.x]% or [-,-]%	Effciency for trimmed impeller diameter
5	202 mm	Fitted impeller diameter

Or

Figure 5: Name plate horticulture

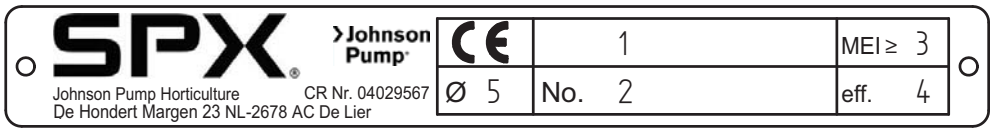


Table 2: Name plate horticulture

1	CB 40C-200 G1	Product type and size
2	11-09 X123500 1/2	Month-year, serial number and number of pumps
3	0,40	Minimum Efficiency Index at max. impeller diameter
4	[xx.x]% or [-,-]%	Effciency for trimmed impeller diameter
5	202 mm	Fitted impeller diameter

Figure 6: Name plate ATEX certified

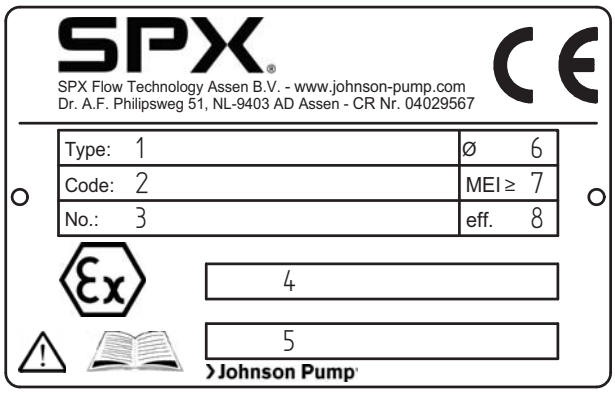


Table 3: Name plate ATEX certified

1	CB 40C-200	Product type and size
2	G1	Smartcode
3	12-1000675A	Year and serial number
4	II 2G c T3-T4	Ex marking
5	KEMA03 ATEX2384	Certificate number
6	202 mm	Fitted impeller diameter
7	0,40	Minimum Efficiency Index at max. impeller diameter
8	[xx.x]% or [-,-]%	Effciency for trimmed impeller diameter

1 Minimum efficiency index, MEI:

Table 4: MEI value

	Speed [rpm]	**MEI value according prEN16480**			**Remarks**
Material		**Cast iron**	**Bronze[1)]**	**St.St.[2)]**	
25-125	2900				Outside scope
25-160	2900				Outside scope
32-125	2900	> 0,40	> 0,40	> 0,40	
32C-125	2900	> 0,40	> 0,40	> 0,40	
32-160	2900	> 0,40	> 0,40	> 0,40	
32A-160	2900	> 0,40	> 0,40	> 0,40	
32C-160	2900	> 0,40	> 0,40	> 0,40	
32-200	2900	> 0,40	> 0,40	> 0,40	
32C-200	2900	> 0,40	> 0,40	> 0,40	
32-250	2900	> 0,40	> 0,40	> 0,40	
40C-125	2900	> 0,40	> 0,40	> 0,40	
40C-160	2900	> 0,40	> 0,40	> 0,40	
40C-200	2900	> 0,40	> 0,40	> 0,40	
40-250	2900	> 0,40	> 0,40	> 0,40	
50C-125	2900	> 0,40	> 0,40	> 0,40	
50C-160	2900	> 0,40	> 0,40	> 0,40	
50C-200	2900	> 0,40	> 0,40	> 0,40	

Table 4: MEI value

	Speed [rpm]	MEI value according prEN16480			Remarks
Material		**Cast iron**	**Bronze[1)]**	**St.St.[2)]**	
50-250	2900	> 0,40	> 0,40	> 0,40	
65C-125	2900	> 0,40	> 0,40	> 0,40	
65C-160	2900	> 0,40	> 0,40	> 0,40	
65C-200	2900	> 0,40	> 0,40	> 0,40	
65A-250	2900	> 0,40	> 0,40	> 0,40	
80C-160	2900	> 0,40	> 0,40	> 0,40	
80C-200	2900	> 0,40	> 0,40	> 0,40	
80-250	2900	> 0,40	> 0,40	> 0,40	
80A-250	2900	> 0,40	> 0,40	> 0,40	
100-160	2900	> 0,40	> 0,40	x	
100C-200	2900	> 0,40	> 0,40	> 0,40	
100C-250	2900	> 0,40	> 0,40	> 0,40	
125-125	1450			x	Not available
125-250	1450	> 0,40	> 0,40	> 0,40	
125-315	1450	> 0,40	> 0,40	> 0,40	
150-125	1450	---	---	x	Outside scope, ns > 80 rpm
150-160	1450	---	---	x	Outside scope, ns > 80 rpm
150-200	1450	> 0,40	> 0,40	x	
150-250	1450			x	Not available
200-160	1450	---	---	x	Outside scope, ns > 80 rpm
200-200	1450	> 0,40	> 0,40	x	
250-200	1450	> 0,40	> 0,40	x	

St.St. = stainless steel

1) impeller or pump in bronze

2) impeller or pump in stainless steel

x = not available in delivery program

2 The benchmark for most efficient water pumps is MEI ≥ 0,70.

3 Year of manufacture; the first 2 positions (= the last 2 positions of the year) of the serial number of the pump as marked on the rating plate. An example and explanation is given in paragraph 2.6.5 "Product information" of this document.

4 Manufacturer:

SPX Flow Technology Assen B.V.
Registration number at Chamber of Commerce 04 029567
Dr. A.F. Philipsweg 51
9403 AD Assen
The Netherlands

Location Horticulture:

SPX Flow Technology Assen B.V.
Registration number at Chamber of Commerce 04 029567
Johnson Pump Horticulture
De Hondert Margen 23
2678 AC De Lier
The Netherlands

5 Product type and size identifier are marked on the rating plate. An example and explanation is given in paragraph 2.6.5 "Product information" of this document.

6 The hydraulic pump efficiency of the pump with trimmed impeller diameter is marked on the rating plate, either the efficiency value [xx.x]% or [-.-]%.

7 Pump curves, including efficiency characteristics, are published in the downloadable software program “Hydraulic Investigator 2” from the SPX website. For downloading “Hydraulic Investigator 2” go to http://www.spx.com/en/johnson-pump/resources/hydraulic-investigator/ The pump curve for the delivered pump is part of the related customer order documentation package separate from this document.

8 The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with the full impeller diameter. The trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.

9 The operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system.

10 Information relevant for disassembly, recycling or disposal at end-of-life is described in paragraph 2.8 "Re-use", paragraph 2.9 "Scrapping" and chapter 7 "Disassembly and assembly".

11 The benchmark efficiency Fingerprint Graphs are published for:

MEI = 0,40	MEI = 0,70
ESOB 1450 rpm	ESOB 1450 rpm
ESOB 2900 rpm	ESOB 2900 rpm
ESCC 1450 rpm	ESCC 1450 rpm
ESCC 2900 rpm	ESCC 2900 rpm
ESCCi 1450 rpm	ESCCi 1450 rpm
ESCCi 2900 rpm	ESCCi 2900 rpm
Multistage Vertical 2900 rpm	Multistage Vertical 2900 rpm
Multistage Submersible 2900 rpm	Multistage Submersible 2900 rpm

Benchmark efficiency graphs are available under http:\\www.europump.org/efficiencycharts.

2.7 Application area

The application area globally looks as follows:,

Table 5: Application area.

	Maximum value
Capacity	850 m^3/h
Discharge head	105 m
System pressure	10 bar
Temperature	120 °C (briefly 140 °C)

2.8 Re-use

The pump may only be used for other applications after prior consultation with SPX or your supplier. Since the lastly pumped medium is not always known, the following instructions should be observed:

1 flush the pump properly.

2 make sure the flushing liquid is discharged safely (environment!)

⚠ ***Take adequate precautions and use the appropriate personal protection means like rubber gloves and spectacles!***

2.9 Scrapping

If it has been decided to scrap a pump, the same flushing procedure as described for Re-use should be followed.

3 Installation

3.1 Safety

- Read this manual carefully prior to installation and commissioning. Non-observance of these instructions can result in serious damage to the pump and this will not be covered under the terms of our guarantee. Follow the instructions given step by step.
- Ensure that the pump can not be started if work has to be undertaken to the pump during installation and the rotating parts are insufficiently guarded.
- Depending on the design the pumps are suitable for liquids with a temperature of up to 110°C. When installing the pump unit to work at 65°C and above the user should ensure that appropriate protection measures and warnings are fitted to prevent contact with the hot pump parts.
- If there is danger of static electricity, the entire pump unit must be earthed.
- If the pumped liquid is harmful to men or the environment, take appropriate measures to drain the pump safely. Possible leakage liquid from the shaft seal should also be discharged safely.

3.2 Preservation

In order to prevent corrosion, the inside of the pump is treated with a preserving agent before leaving the factory.

Before commissioning the pump remove any preserving agents and flush the pump thoroughly with hot water.

3.3 Environment

- The foundation must be hard, level and flat.
- The area in which the pump is installed must be sufficiently ventilated. An ambient temperature or air humidity which is too high, or a dusty environment, can have a detrimental effect on the operation of the electric motor.
- There should be sufficient space around the pump unit to operate and if necessary repair it.
- Behind the cooling air inlet of the motor there must be a free area of at least ¼ of the electric motor diameter, to ensure unobstructed air supply.

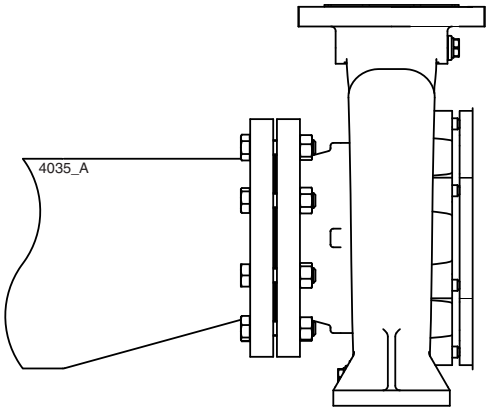
3.4 Installation of a pump unit

If the unit is delivered as a complete set, pump and motor are assembled in the works. In that case the impeller has already been properly adjusted axially. In case of permanent arrangement, level the pump on the foundation by means of shims and carefully tighten the nuts of the foundation bolts.

3.5 Piping

- The piping to the suction and delivery connections must fit exactly and must not be subject to stress during operation. For the maximum allowable forces and moments on the pump flanges see paragraph 10.6 "Permitted forces and torques on the flanges, based on EN-ISO 5199".
- The passage of the suction pipe must be amply dimensioned. This pipe should be as short as possible and run towards the pump in such a way that no air pockets can arise. If this is not possible, a venting facility should be provided at the highest point of the pipe. If the inside diameter of the suction pipe is larger than the suction connection of the pump, an eccentric reducer should be applied to prevent air pockets and whirls. See figure 7.

Figure 7: Eccentric reducer to suction flange.



- The maximum allowable system pressure is stated in paragraph 2.7 "Application area". If there is a risk that this pressure might be exceeded, for instance because of an excessive inlet pressure, appropriate measures should be taken by mounting a safety valve in the piping.
- Sudden changes in the rate of flow can lead to high pressure impulses in the pump and the piping (water shock). Therefore, do not use quick-acting closing devices, valves etc.

3.6 Accessories

- Fit any parts that may have been supplied separately.
- If the liquid does not flow towards the pump, fit a foot valve at the bottom of the suction pipe. If necessary, combine this foot valve with a suction strainer to prevent impurities from being drawn in.
- When mounting, place temporarily (for the first 24 operating hours) a fine gauze between suction flange and suction pipe to prevent internal pump parts from being damaged by foreign matter. If the risk of damage continues to exist, fit a permanent filter.
- In case the pump is provided with an isolation, special attention has to be paid To temperature limits of shaft seal and bearing.

3.7 Connection of the electric motor

⚠ ***The electric motor must be connected to the mains by an approved electrician, according to the locally prevailing regulations of the electricity company.***

- Refer to the instruction manual belonging to the electric motor.
- If possible, fit a working switch as close as possible to the pump.

4 Commissioning

4.1 Inspection of the pump

- Check whether the stub shaft turns freely. Do this by turning the shaft end at the coupling a few times by hand.

4.2 Inspection of the motor

- Check whether the fuses have been mounted.

4.3 Preparing the pump unit for commissioning

Proceed as follows, both when the unit is put into operation for the first time and after the pump has been overhauled:

1 Fully open the stop valve in the suction pipe. Close the delivery stop valve.

2 Fill the pump and the suction pipe with the liquid to be pumped.

3 Turn the stub shaft a few times by hand and add more liquid, if necessary.

4.4 Checking the sense of rotation

⚠ ***Beware of possible non-screened rotating parts, when checking the sense of rotation!***

1 The sense of rotation of the pump is indicated by an arrow. Check whether the sense of rotation of the motor corresponds with that of the pump.

2 Let the motor run for only a short time and check the sense of rotation.

3 If the sense of rotation is **not** correct, alter the sense of rotation. See the instructions in the user manual belonging to the electric motor.

4 Fit the guard.

4.5 Start-up

1 Start the pump.

2 As soon as the pump is under pressure, slowly open the delivery stop valve until the working pressure is attained.

⚠ ***Make sure that when a pump is running, rotating parts are always properly screened by the guard!***

4.6 Pump in operation

When the pump is in operation, pay attention to the following:

- The pump should never run dry.
- Never use a stop valve in the suction line to control pump output. The stop valve should always be fully opened during operation.
- Check whether the absolute inlet pressure is sufficient, to prevent vaporization in the pump.
- Check whether the pressure difference between suction and delivery side corresponds with the specifications of the pump's duty point.
- A mechanical seal may never show visible leakage.

4.7 Noise

The noise production of a pump depends to a great extent on the operating conditions. The values stated in paragraph 10.7 "Noise data" are based on normal operation of the pump, driven by an electric motor. In case the pump is driven by a combustion engine, or in case it is used outside the normal operation area, as well as in case of cavitation, the noise level may exceed 85 dB(A). In that case precautions should be taken, like building a noise-barrier around the unit or wearing hearing protection.

5 Maintenance

5.1 Regular maintenance

Regularly check the outlet pressure.

⚠ ***No water should get into the terminal box of the electric motor when the pump room is sprayed clean!***
Never spray water on hot pump parts! The sudden cooling down may cause them to burst and hot water may flow out!

! **Flawed maintenance will result in shorter lifespan, possible break down and in any event loss of warranty.**

5.2 Mechanical seal

A mechanical seal generally requires no maintenance, however, **it should never be allowed to run dry**. If there are no problems, do not dismantle the mechanical seal. As the seal faces have run in on one another dismantling usually implicates replacement of the mechanical seal. If a mechanical seal shows any leakage it has to be replaced.

5.3 Lubrication of the bearings

For maintenance of the motor bearings we refer to the instructions of the motor supplier concerned.

5.4 Environmental influences

- Regularly clean the filter in the suction pipe or the suction strainer at the bottom of the suction pipe, as the inlet pressure may become too low if the filter or the suction strainer is fouled.
- If there is a risk that the pumped liquid expands during solidification or freezing, the pump has to be drained and, if necessary, flushed after it has been put out of service.
- If the pump is out of service for a long time, it has to be preserved.
- Check motor for accumulation of dust or dirt, which might influence motor temperature.

5.5 Noise

If a pump starts making noise, this may point to certain problems with the pump unit. A crackling noise can indicate cavitation or excessive motor noise can indicate deterioration of the bearings.

5.6 Motor

Check motor specifications for start-stop frequency.

5.7 Faults

The pump, of which you want to determine the fault, may be hot or under pressure. Take the appropriate precautions first and protect yourself with the proper safety devices (safety goggles, gloves, protective clothing)!

To determine the source of the malfunctioning of the pump, proceed as follows:

1 Switch off the power supply to the pump unit. Lock the working switch with a padlock or remove the fuse.

2 Close the stop valves.

3 Determine the nature of the fault.

4 Try to determine the cause of the fault with chapter 6 "Problem solving" and take the appropriate measures or contact your installer.

6 Problem solving

Faults in a pump installation can have various causes. The fault may not be in the pump, it may also be caused by the pipe system or the operating conditions. Firstly, always check that installation has been executed in accordance with the instructions in this manual and that the operating conditions still correspond with the specifications for which the pump was purchased.

In general, breakdowns in a pump installation are attributable to the following causes:

- Faults with the pump.
- Breakdowns or faults in the pipe system.
- Faults due to incorrect installation or commissioning.
- Faults due to incorrect choice of pump.

A number of the most frequently occurring failures as well as their possible causes are shown in the table below.

Table 6: Most frequently occurring failures.

Most common faults	**Possible causes, see Table 7.**
Pump delivers no liquid	1 2 3 4 8 9 10 11 13 14 17 19 20 21 29
Pump has insufficient volume flow	1 2 3 4 8 9 10 11 13 14 15 17 19 20 21 28 29
Pump has insufficient head	2 4 13 14 17
Pump stops after start up	1 2 3 4 8 9 10 11
Pump has higher power consumption than normal	12 15 16 17 18 22 23 24 25 26 27 32 38 39
Pump has lower power consumption than normal	13 14 15 16 17 18 20 21 28 29
Mechanical seal has to be replaced to often	23 25 26 30 32 33 36
Pump vibrates or is noisy	1 9 10 11 15 18 19 20 22 23 24 25 26 27 29 37 38 39 40
Bearings wear too much or become hot	23 24 25 26 27 37 38 39 40 42
Pump running rough, hot or seizes	23 24 25 26 27 37 38 39 40 42

Table 7: Possible causes of pump failures.

	Possible causes
1	Pump or suction pipe is not sufficiently filled or de-aerated
2	Gas or air coming from the liquid
3	Air lock in the suction pipe
4	Air leak in the suction pipe
8	The manometric suction head is too high
9	Suction pipe or suction strainer is blocked
10	Insufficient immersion of foot valve or suction pipe during operation of the pump
11	NPSH available too low
12	Speed too high
13	Speed too low
14	Wrong sense of rotation
15	Pump does not operate at the right duty point
16	Liquid density differs from the calculated liquid density
17	Liquid viscosity differs from the calculated liquid viscosity
18	Pump operates when the liquid flow is too low
19	Wrong pump selection
20	Obstruction in impeller or pump casing
21	Obstruction in the piping
22	Wrong installation of the pump unit
24	Rotating part running out of true
25	Imbalance in rotating parts (for instance: impeller or stub shaft)
26	Stub shaft is running out of true
27	Bearings faulty or worn out
28	Wear ring faulty or worn out
29	Damaged impeller
30	Seal faces of the mechanical seal are worn out or damaged
32	Bad mounting of the mechanical seal
33	Mechanical seal not suitable for the pumped liquid or operation circumstances
36	Flushing liquid to the mechanical seal is polluted
37	Axial retaining of impeller or stub shaft is defective
40	Wrong or polluted lubricant
42	Too high axial force because of worn dorsal blades or excessive inlet pressure

7 Disassembly and assembly

7.1 Precautionary measures

⚠ ***Take adequate measures to avoid that the motor is started while you are working on the pump. This is especially important for electric motors with remote control:***

- Switch the operating switch near the pump (if available) to "OFF".
- Switch off the pump switch on the switchboard.
- If necessary remove the fuses.
- Hang a danger board near the switchboard cabinet.

7.2 Special tools

Assembly and disassembly work requires no special tools. However, such tools can make certain jobs easier, for instance replacing the shaft seal. If such is the case it will be indicated in the text.

7.3 Liquid draining

! **Make sure no liquid gets into the environment!**

Before starting any disassembly the pump should be drained.

1 If necessary, close the valves in the suction and delivery pipe and in the flushing or cooling supply lines to the shaft seal.

2 Remove the drain plug (0310).

3 If harmful liquids are pumped wear protective gloves, shoes, glasses, etc., and thoroughly flush the pump.

4 Refit the drain plug.

7.4 Disassembly

7.4.1 Back-Pull-Out system

The pumps are designed with a Back-Pull-Out system. The entire rotating section can be removed together with the motor. This means that almost the whole pump can be dismantled without having to detach the suction and delivery piping.

7.4.2 Disassembling the Back-Pull-Out unit

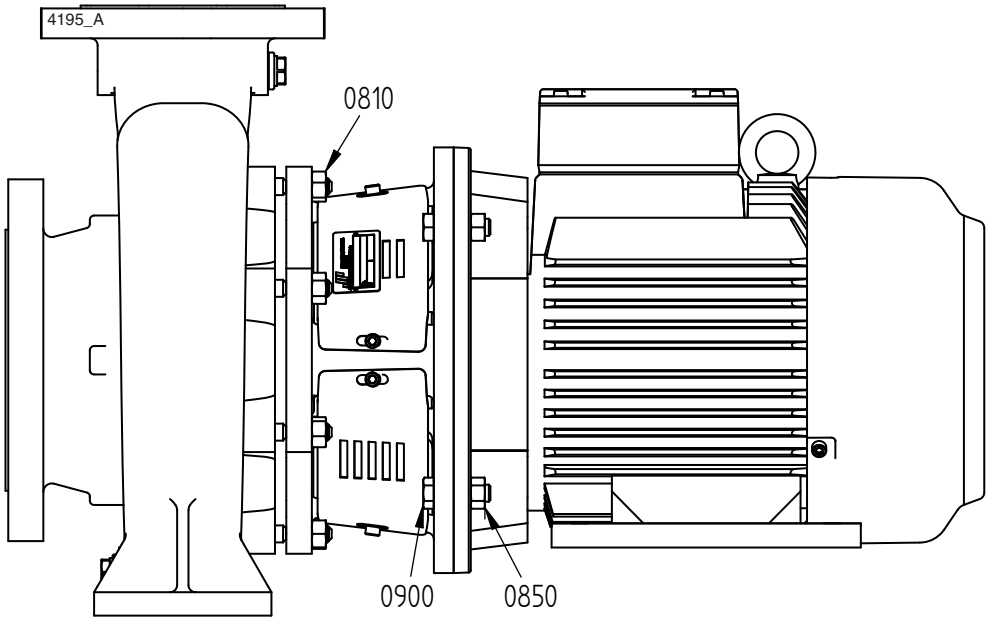


Figure 8: Back-Pull-Out principle.

1 Open the terminal box and loosen the wires.

2 If the electric motor has been mounted on a separate foundation, loosen the electric motor.

3 Remove the nuts (0810).

! NEVER start dismantling by loosening the motor bolts (0850) and nuts (0900). This may result in irrepairable damage to the mechanical seal and the impeller!

4 Pull the motor together with the entire lantern piece out of the pump casing. The Back-Pull-Out unit large pumps is very heavy. Support it with a beam or hang it in a pulley sling.

7.4.3 Assembling the Back-Pull-Out unit

1 Fit a new gasket (0300) into the pump casing.

2 Mount the complete lantern piece with motor back into the pump casing.

3 Fit the nuts (0810) and tighten them crosswise with the proper tightening torque. See paragraph 10.2 "Tightening moments".

7.5 Replacing the impeller and the wear ring

The play between the impeller and the wear ring is 0,3 mm to the diameter at delivery. In case the play has increased to 0,5-0,7 mm due to wear, the impeller and the wear ring should be replaced.

7.5.1 Disassembling the impeller

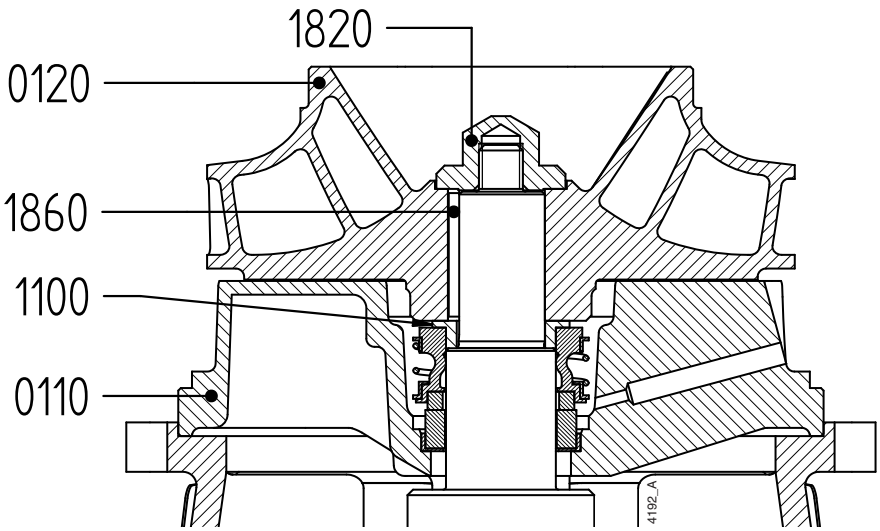


Figure 9: Disassembling the impeller.

The item numbers used are referring to figure 9.

1 Remove the Back-Pull-Out unit, see paragraph 7.4.2 "Disassembling the Back-Pull-Out unit".

2 Remove the cap nut (1820). Sometimes the nut has to be heated to break the Loctite-contact.

3 Remove the impeller (0120) with a pulley puller, or wrest the impeller by inserting for instance 2 big screwdrivers between the impeller and the pump cover (0110).

4 Remove the impeller key (1860).

5 Remove the distance sleeve (1100) with the rotating part of the mechanical seal (1220).

6 Pump size 200-160 only: Loosen the set screws (1260). Remove the shaft sleeve (1200) and the rotating part of the mechanical seal (1220).

7.5.2 Mounting the impeller

Pump size 200-160 only:

1 Fit the rotating part of the mechanical seal on the stub shaft.

2 Fit the shaft sleeve (1200) and set the distance to the shaft collar to 44 mm. See figure 13 of paragraph 7.6.3 "Assembling a mechanical seal M1". Tighten the set screws (1260).

Other types:

1 Fit the rotating part of the mechanical seal on the distance sleeve.

2 Fit the distance sleeve with the rotating part of the mechanical seal on the stub shaft.

All types:

1 Place the impeller key in the key way of the stub shaft.

2 Push the impeller onto the stub shaft against the distance sleeve.

3 Degrease the thread on the stub shaft and the thread in the cap nut.

4 Put a drop of Loctite 243 on the thread and fit the cap nut. For tightening moment of the nut see paragraph 10.2.2 "Tightening moments for cap nut".

5 Mount the Back-Pull-Out unit, see paragraph 7.4.3 "Assembling the Back-Pull-Out unit".

7.5.3 Disassembling the wear ring

After removing the Back-Pull-Out unit the wear ring can be removed. In most cases the ring has been fixed so tightly that it cannot be removed undamaged.

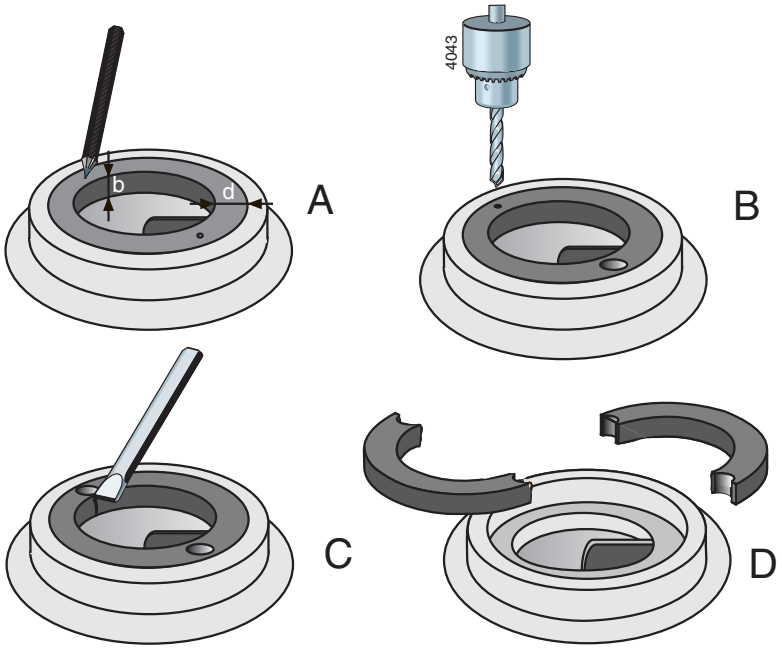


Figure 10: Removal of wear ring.

1 Measure the thickness (D) and the width (B) of the ring, see figure 10 A.

2 Make a centre hole in the middle of the edge of the ring at two opposite points, see figure 10 B.

3 Use a drill with a diameter just a little bit smaller than the thickness (D) of the ring and drill two holes in the ring, see figure 10 C. Don't drill deeper than the width (B) of the ring. Take care not to damage the fitting edge of the pump casing.

4 Use a chisel to cut the remaining part of the ring thickness. Now you can remove the ring in two parts from the pump casing, see figure 10 D.

5 Clean the pump casing and carefully remove all bore dust and metal splinters.

7.5.4 Assembling the wear ring

1 Clean and degrease the fitting edge of the pump casing where the wear ring is to be mounted.

2 Degrease the outer edge of the wear ring and put a few drops of Loctite 641 on it.

3 Fit the wear ring in the pump casing. **Take care it is not pushed out of alignment!**

7.6 Mechanical seal

7.6.1 Instructions for mounting a mechanical seal

➢ *First read the following instructions regarding the mounting of a mechanical seal. Follow these instructions closely when mounting a mechanical seal.*

- **Leave the assembly of a mechanical seal with PTFE (Teflon) covered O-rings to a specialist.** These rings are easily damaged during assembly.
- A mechanical seal is a fragile precision instrument. Leave the seal in its original packing until you are ready to fit it!
- Clean all receiving parts properly. Make sure your hands and working environment are clean!
- **Never touch the sliding surfaces with ones fingers!**
- Take care not to damage the seal during assembly. Never put the rings down on their sliding surfaces!

➢ *Special tools: Mounting the mechanical seal unit is easier when you use a special tapered mounting bush. That way, the sharp shaft edges are covered so that the risk of damaging the seal during assembly is reduced. See figure 11.*

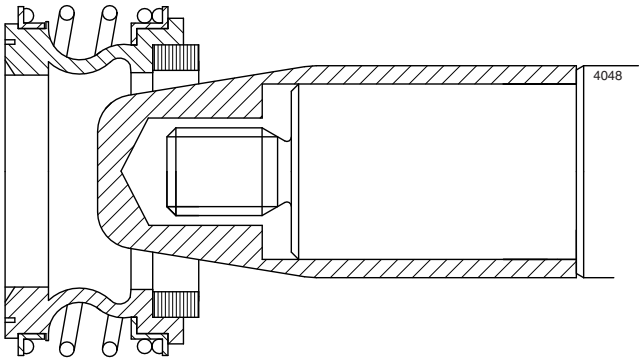


Figure 11: Special mounting bush.

7.6.2 Disassembling a mechanical seal M1

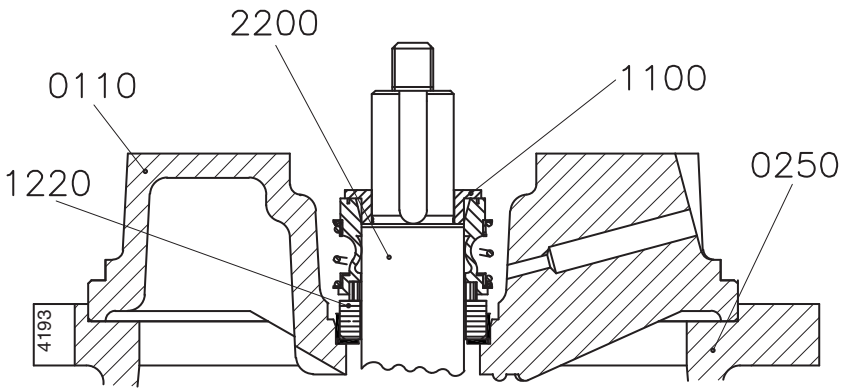


Figure 12: Mechanical seal M1.

The item numbers used are referring to figure 12.

1 Remove the impeller, see paragraph 7.5.1 "Disassembling the impeller".

2 Pump size 200-160 only: Loosen the set screws (1260). See paragraph Figure 13: "Adjusting the mechanical seal M1 of pump size 200-160.".

3 Pull the distance sleeve (1100) (Pump size 200-160: spacer sleeve (1200)) and the rotating part of the mechanical seal (1220) off the shaft.

4 Mark the position of the pump cover (0110) in relation to the lantern piece (0250). Knock the pump cover loose and remove it.

5 Push the counter-ring of the mechanical seal (1220) out of the pump cover.

7.6.3 Assembling a mechanical seal M1

1 Make sure the stub shaft (2200) is not damaged. If it is, replace it.

2 Place the electric motor with the shaft upright.

3 Put the pump cover flat down and press the counter-ring of the seal straight into it. If necessary, use a plastic pressure piece. **Never hammer it inside!** The maximum axial turn of the counter-ring is 0,1 mm.

4 Mount the pump cover in the right position in the collar of the lantern piece. Check whether the pump cover is at right angles to the stub shaft.

5 Push the rotating part of the mechanical seal on the distance sleeve (1100). **Put some glycerine or silicon spray on the bellows to facilitate the assembly!**

6 Pump size 200-160 only: Push the rotating part of the mechanical seal and the spacer sleeve (1200)) on the the stub shaft.

7 Pump size 200-160 only: Set the distance between the spacer sleeve and the shaft collar at **44 mm**. Fix the spacer sleeve by means of set screws (1260). See figure 13.

8 Mount the impeller, see paragraph 7.5.2 "Mounting the impeller".)

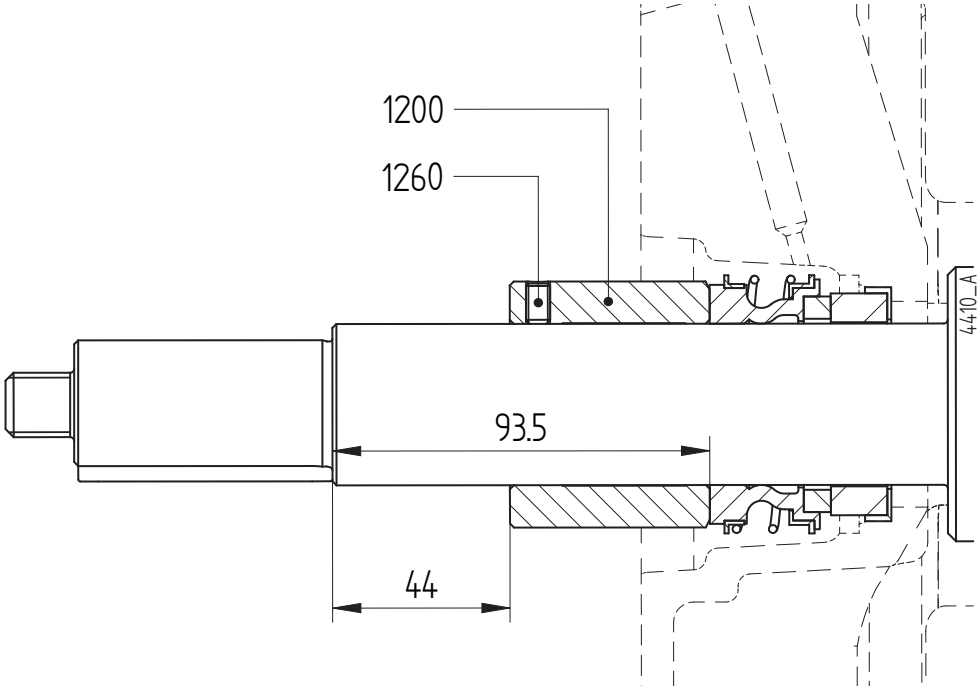


Figure 13: Adjusting the mechanical seal M1 of pump size 200-160.

7.7 Replacing the stub shaft and the motor

7.7.1 Disassembling the stub shaft and the motor of pump size 25-...

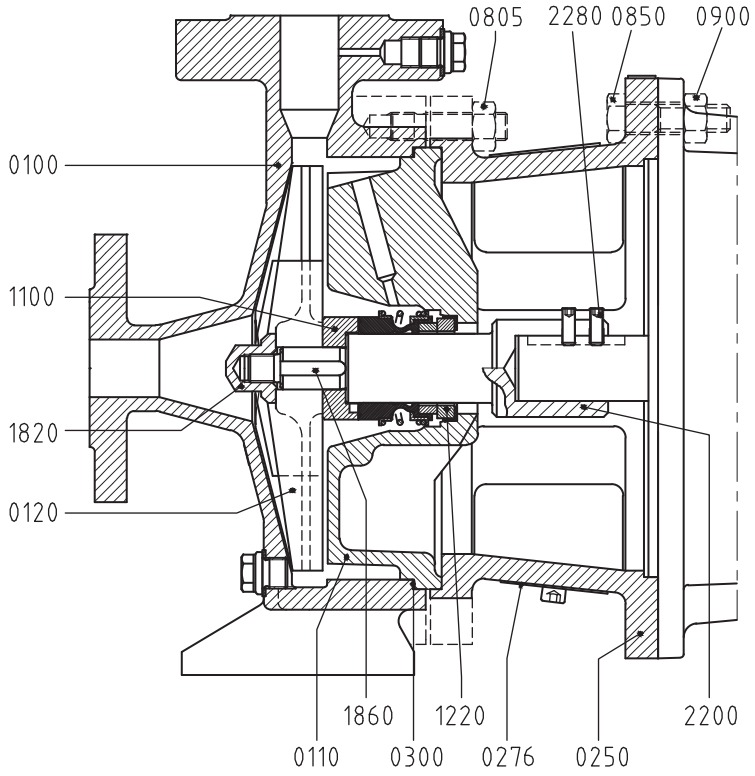


Figure 14: Assembly of the stub shaft of pump size 25-...

The item numbers used are referring to figure 14.

1 Dismantle the impeller and the shaft seal. See paragraph 7.5.1 "Disassembling the impeller" and paragraph 7.6.2 "Disassembling a mechanical seal M1".

2 Loosen the bolts (0850) and nuts (0900) and remove the lantern piece (0250) from the motor.

3 Remove the seal guards (0276).

4 Loosen the set screws (2280) and pull the stub shaft (2200) from the motor shaft.

7.7.2 Assembling the stub shaft and the motor of pump size 25-...

1 Remove the key from the motor shaft.

2 Put the motor in vertical position, shaft end up. Fit the stub shaft (2200) on the motor shaft. Make sure the set screws (2280) are positioned over the key way in the motor shaft. **Do not fix the stub shaft yet!**

3 Fit the lantern piece (0250) to the electric motor with bolts (0850) and nuts (0900).

4 Mount the pump cover (0110), the mechanical seal (1200) and the impeller (0120), see paragraph 7.6.3 "Assembling a mechanical seal M1" and paragraph 7.5.2 "Mounting the impeller".

5 Fit the pump casing (0100) to the lantern piece **without gasket** (0300).

6 Fix the pump casing temporarily with 2 nuts (0810).

7 Push the stub shaft towards the pump casing, until the impeller touches the pump casing.

8 Fix the stub shaft on the motor shaft with the set screws (2280).

9 Unscrew the nuts (0810) and remove the pump casing.

10 Place a new gasket (0300) and fit the pump casing. Fix the pump casing with nuts (0810). Tighten them crossways with the proper tightening moment. See paragraph 10.2 "Tightening moments".

11 Fit the seal guards (0276).

7.7.3 Disassembling the stub shaft and the motor

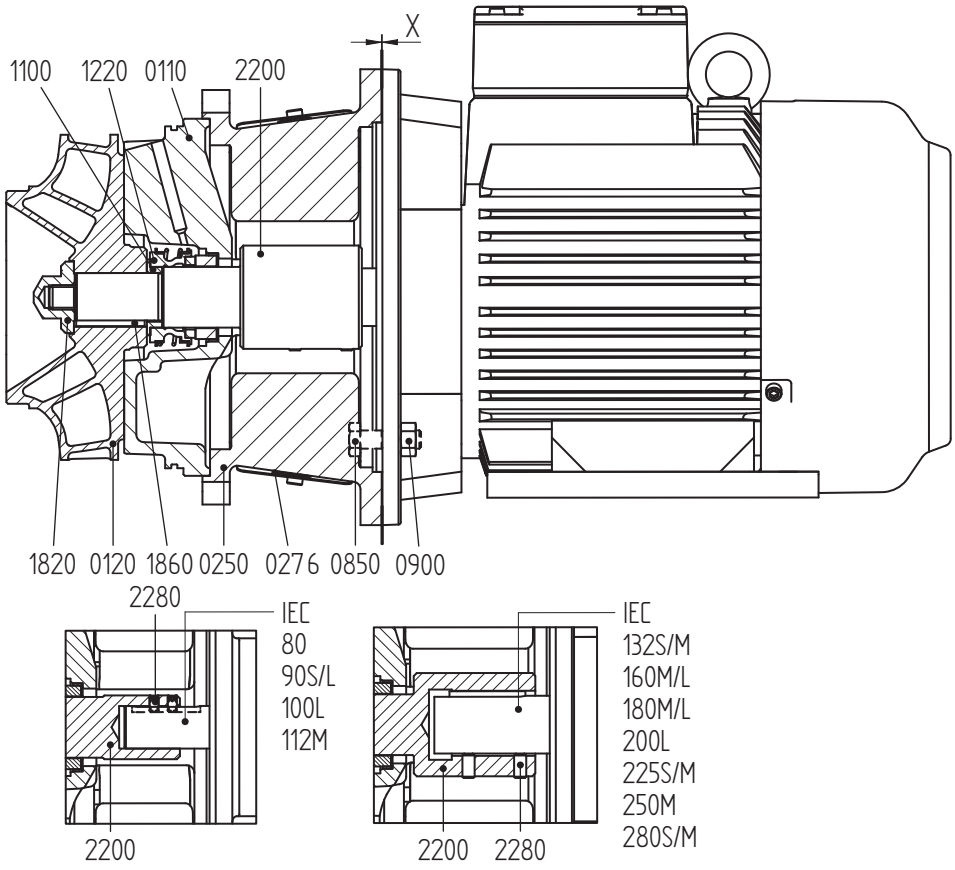


Figure 15: Assembly of the stub shaft

The item numbers used are referring to figure 15.

1 Dismantle the impeller and the shaft seal. See paragraph 7.5.1 "Disassembling the impeller" and paragraph 7.6.2 "Disassembling a mechanical seal M1".

2 Loosen the bolts (0850) and nuts (0900) and remove the lantern piece (0250) from the motor.

3 Remove the seal guards (0276).

4 Loosen the set screws (2280) and pull the stub shaft (2200) from the motor shaft.

7.7.4 Assembling the stub shaft and the motor

1 For electric motors with IEC-size 80 upto and including 112M: Remove the key from the motor shaft.

2 Put the motor in vertical position, shaft end up. Fit the stub shaft (2200) on the motor shaft. **Do not fix the stub shaft yet!**

3 For electric motors with IEC size 80 upto and including 112M: make sure the set screws (2280) are positioned over the key way in the motor shaft.

4 Place shims between the lantern piece and the motor flange and fit the lantern piece (0250) to the electric motor. See Table 8 for the proper thickness X of the shims

Table 8: Shim thickness X for adjusting the stub shaft

Pump type	Shim thickness X
32-125 R6 (stainless steel)	2 mm
32-160 R6 (stainless steel)	2,5 mm
40-125 R6 (stainless steel)	3,5 mm
all other types	0,5 mm

5 Mount the pump cover (0110), the mechanical seal (1200) and the impeller (0120).

6 Push the impeller on the stub shaft until the back blades touch the pump cover.

7 Fix the stub shaft on the motor shaft with the set screws (2280).

8 Slightly loosen the fastening bolts (0850) of the electric motor and remove the shims.

9 Tighten the fastening bolts (0850) of the electric motor crossways with the prescribed tightening moment, see paragraph 10.2.1 "Tightening moments for bolts and nuts".

10 Place the gasket (0300) and fit the pump casing (0100). Fix the pump casing with nuts (0810). Tighten them crossways. see paragraph 10.2.1 "Tightening moments for bolts and nuts".

11 Fit the seal guards (0276).

8 Dimensions

8.1 Dimension drawings

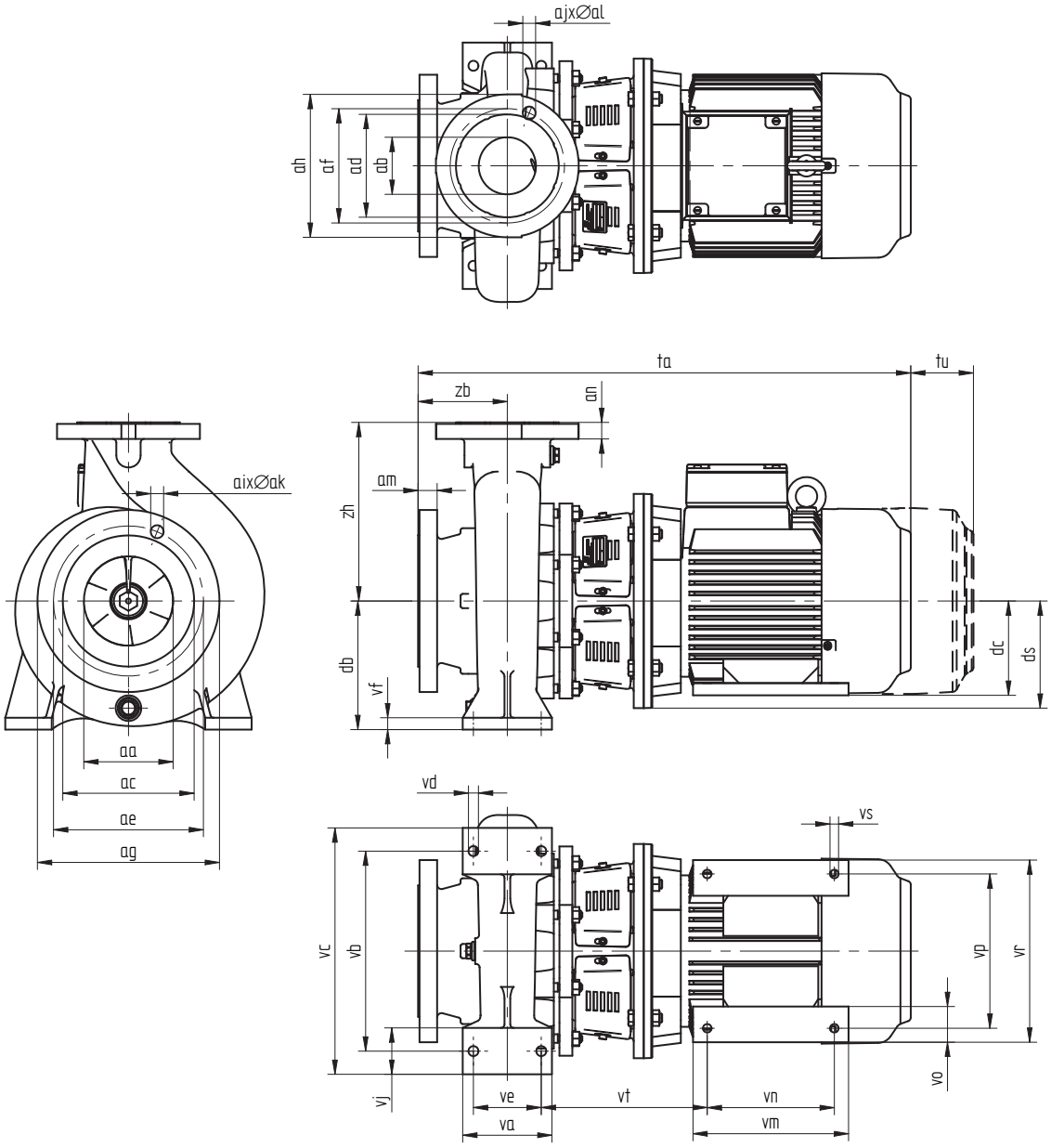


Figure 16: Pump dimensions.

8.2 Motor feet dimensions

IEC	dc	ds	vm	vn	vo	vp	vr	vs
80	80	100						
90S	90	100						
90L	90	100						
100L	100	125						
112M	112	125						
132S	132	150	202	140	47	216	255	12
132M	132	150	240	178	47	216	255	12
160M	160	175	270	210	60	254	314	15
160L	160	175	314	254	60	254	314	15
180M	180	175	300	241	65	279	346	15
180L	180	175	338	279	65	279	346	15
200L	200	200	385	305	80	318	398	19
225S	225	200	370	286	85	356	441	19
225M	225	200	370	311	85	356	441	19
250M	250	275	439	349	90	406	496	24
280S	280	275	454	368	100	457	557	24
280M	280	275	520	419	100	457	557	24

8.3 Flange dimensions

8.3.1 Cast iron and bronze G, B

ISO 7005 PN6											
aa	**ab**	**ac**	**ad**	**ae**	**af**	**ag**	**ah**	**ai x ak**	**aj x al**	**am**	**an**
32	25	64,5	50,8	90	75	117,5	108	4 x 14	4 x 11	12	12

ISO 7005 ≅ EN 1092-2

ISO 7005 PN16											
aa	**ab**	**ac**	**ad**	**ae**	**af**	**ag**	**ah**	**ai x ak**	**aj x al**	**am**	**an**
25	25	68	68	86	86	115	115	4 x 14	4 x 14	14	14
50	32	102	78	125	100	165	140	4 x 18	4 x 18	20	18
65	40	122	88	145	110	185	150	4 x 18	4 x 18	20	18
65	50	122	102	145	125	185	165	4 x 18	4 x 18	20	20
80	65	138	122	160	145	200	185	8 x 18	4 x 18	22	20
100	80	158	138	180	160	220	200	8 x 18	8 x 18	22	22
100	100	158	158	180	180	220	220	8 x 18	8 x 18	22	22
125	100	188	158	210	180	250	220	8 x 18	8 x 18	24	22
125	125	188	188	210	210	250	250	8 x 18	8 x 18	24	24
150	125	212	188	240	210	285	250	8 x 23	8 x 18	24	24
150	150	212	212	240	240	285	285	8 x 23	8 x 23	24	24

ISO 7005 ≅ EN 1092-2

ISO 7005 PN10											
aa	**ab**	**ac**	**ad**	**ae**	**af**	**ag**	**ah**	**ai x ak**	**aj x al**	**am**	**an**
200	150	268	212	295	240	340	285	8 x 23	8 x 23	26	24
200	200	268	268	295	295	340	340	8 x 23	8 x 23	26	26
250	250	320	320	350	350	395	395	12 x 23	12 x 23	28	28

ISO 7005 ≅ EN 1092-2

8.3.2 Stainless steel R

ISO 7005 PN6											
aa	**ab**	**ac**	**ad**	**ae**	**af**	**ag**	**ah**	**ai x ak**	**aj x al**	**am**	**an**
32	25	64,5	50,8	90	75	117,5	108	4 x 14	4 x 11	12	12

ISO 7005 ≅ EN 1092-1

ISO 7005 PN16											
aa	**ab**	**ac**	**ad**	**ae**	**af**	**ag**	**ah**	**ai x ak**	**aj x al**	**am**	**an**
25	25	68	68	85	85	115	115	4 x 14	4 x 14	16	16
50	32	99	76	125	100	165	140	4 x 18	4 x 18	22,5	20,5
65	40	118	84	145	110	185	150	4 x 18	4 x 18	22,5	20,5
80	50	132	99	160	125	200	165	8 x 18	4 x 18	22,5	22,5
100	65	156	118	180	145	230	185	8 x 18	4 x 18	26,5	22,5
125	80	184	132	210	160	255	200	8 x 18	8 x 18	26,7	23,1
125	100	184	156	210	180	255	230	8 x 18	8 x 18	26,5	26,9
150	125	216	186	240	210	285	255	8 x 22	8 x 18	28	27,1

ISO 7005 ≅ EN 1092-1

8.4 Pump dimensions

CB	aa*	ab*	aa**	ab**	db*	db**	tu	va	vb	vc	vd	ve	vf*	vf**	vj	zb*	zb**	zh
25-125	32	25	32	25	100	100	100	100	140	170	12	70	10	10	35	62	62	115
25-160	25	25	25	25	132	132	100	100	190	220	14	70	10	10	35	64,5	64,5	152
32-125					112	112	100	100	140	190	14	70	10	14	50	80	80	140
32C-125					112	112	100	100	140	190	14	70	10	14	50	80	80	140
32-160					132	132	100	100	190	240	14	70	12	14	50	80	80	160
32A-160					132	132	100	100	190	240	14	70	12	14	50	80	80	160
32C-160	50	32	50	32	132	132	100	100	190	240	14	70	12	14	50	80	80	160
32-200					160	160	100	100	190	240	14	70	12	14	50	80	80	180
32C-200					160	160	100	100	190	240	14	70	12	14	50	80	80	180
32-250					180	180	100	125	250	320	14	95	14	14	65	100	100	225
40C-125					112	112	100	100	160	210	14	70	10	14	50	80	80	140
40C-160					132	132	100	100	190	240	14	70	12	14	50	80	80	160
40C-200	65	40	65	40	160	160	100	100	212	265	14	70	12	14	50	100	100	180
40-250					180	180	100	125	250	320	14	95	14	16	65	100	100	225
50C-125					132	132	100	100	190	240	14	70	10	12	50	100	100	160
50C-160					160	160	100	100	212	265	14	70	12	14	50	100	100	180
50C-200	65	50	80	50	160	160	100	100	212	265	14	70	12	14	50	100	100	200
50-250					180	180	100	125	250	320	14	95	14	16	65	100	125	225
65C-125					160	160	100	125	21	280	14	95	10	12	65	100	100	180
65C-160					160	160	100	125	212	280	14	95	12	14	65	100	100	200
65C-200	80	65	100	65	180	180	140	125	250	320	14	95	14	16	65	100	100	225
65A-250					200	200	140	160	280	360	18	120	14	14	80	100	125	250
80C-160					180	180	140	125	250	320	14	95	14	16	65	125	125	225
80C-200					180	180	140	125	280	345	14	95	14	16	65	125	125	250
80-250	100	80	125	80	200	225	140	160	315	400	18	120	15	18	80	125	125	280
80A-250					200	225	140	160	315	400	18	120	15	18	80	125	125	280
100-160	125	100	-	-	200	-	100	160	280	360	18	120	15	-	80	125	-	315
100C-200	125	100	125	100	200	200	140	160	280	360	18	120	15	15	80	125	125	280
100C-250	125	100	125	100	225	225	140	160	315	400	18	120	16	16	80	140	140	280
125-125	150	125	-	-	225	-	100	125	250	320	14	95	14	-	65	140	-	300
125-250	150	125	150	125	250	250	140	160	315	400	18	120	18	18	80	140	140	355
125-315	150	125	-	-	280	-	140	200	400	500	23	150	20	-	100	140	-	355
150-125	150	150	-	-	280	-	140	160	315	400	18	120	18	-	80	160	-	400
150-160	150	150	-	-	250	-	100	160	315	400	18	120	18	-	80	160	-	315
150-200	150	150	-	-	250	-	140	160	315	400	18	120	18	-	80	160	-	315
150-250	200	150	-	-	280	-	140	200	400	500	23	150	20	-	100	160	-	400
200-160	200	200	-	-	280	-	140	200	400	500	23	150	22	-	100	200	-	400
200-200	200	200	-	-	280	-	100	200	400	500	23	150	22	-	100	200	-	400
250-200	250	250	-	-	315	-	140	200	450	550	23	150	22	-	100	200	-	450

* cast iron and bronze

** stainless steel

8.5 Overall length (ta)

8.5.1 Cast iron and bronze G, B

Motor	80	90S	90L	100L	112M	132S	132M	160M	160L	180M	180L	200L	225S	225M	250M	280S	280M
CB	ta (*)																
25-125	491	513	537	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-160	491	513	537	581	607	-	-	-	-	-	-	-	-	-	-	-	-
32-125	512	534	558	602	628	-	-	-	-	-	-	-	-	-	-	-	-
32C-125	512	534	558	602	628	-	-	-	-	-	-	-	-	-	-	-	-
32-160	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
32A-160	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
32C-160	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
32-200	512	534	558	602	628	706	-	834	-	-	-	-	-	-	-	-	-
32C-200	512	534	558	602	628	706	-	834	-	-	-	-	-	-	-	-	-
32-250	532	554	578	622	648	726	-	854	898	932	-	-	-	-	-		-
40C-125	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
40C-160	512	534	558	602	628	706	-	834	-	-	-	-	-	-	-	-	-
40C-200	532	554	578	622	648	726	-	854	-	-	-	-	-	-	-	-	-
40-250	532	554	578	622	648	726	-	854	898	932	-	-	-	-	-	-	-
50C-125	532	554	578	622	648	726	-	-	-	-	-	-	-	-	-	-	-
50C-160	532	554	578	622	648	726	-	854	-	-	-	-	-	-	-	-	-
50C-200	532	554	578	622	648	726	-	854	898	932	-	1060	-	-	-	-	-
50-250	532	554	578	622	648	726	-	854	898	932	-	1080	-	-	-	-	
65C-125	532	554	578	622	648	726	-	854	-	-	-		-	-	-	-	-
65C-160	532	554	578	622	648	726	-	854	898	932	-	1060	-	-	-	-	-
65C-200	532	554	578	622	648	726	-	854	898	932	-	1060	-	-	-	-	-
65A-250	-	568	592	636	662	740	778	868	912	946	982	1094	-	1142	-	-	-
80C-160	-	579	603	647	673	751	-	879	923	957	-	1085	-	-	-	-	-
80C-200	-	594	618	662	688	766	804	894	938	972	1008	1100	1144	1168	1376	1536	1536
80-250	-	593	617	661	687	765	803	893	937	971	1007	1119	1143	1167	1395	1555	1555
80A-250	-	593	617	661	687	765	803	893	937	971	1007	1119	1143	1167	1395	1555	1555
100-160	-	594	618	662	688	766	-	894	938	972	-	1100	-	-	-	-	-
100C-200	-	-	-	662	688	766	804	894	938	972	-	1100	-	1168	1376	1536	-
100C-250	-	-	-	676	702	780	818	908	952	986	-	1134	-	1182	1410	1570	1570
125-125	-	-	618	662	688	766		894	-	-	-	-	-	-	-	-	-
125-250	-	-	-	676	702	780	818	908	952	986	1022	1134	-	-	-	-	-
125-315	-	-	-	-	-	802	840	930	974	1008	1044	1136	-	-	-	-	-
150-125	-	-	-	682	708	786	-	-	-	-	-	-	-	-	-	-	-
150-160	-	-	-	697	723	801	839	929	973	1007	-	1135	-	1203	1411	-	-
150-200	-	-	-	697	723	801	839	929	-	-	-	-	-	-	-	-	-
150-250	-	-	-	-	-	808	846	936	980	1014	1050	-	-	-	-	-	-
200-160	-	-	-	737	763	841	879	969	-	-	-	-	-	-	-	-	-
200-200	-	-	-	-	-	840	878	968	1012	1046	1082	1194	-	-	-	-	-
250-200	-	-	-	-	-	848	886	976	1020	1054	1090	1202	-	-	-	-	-

(*): Motor length based on DIN 42677, could be different due to applied motor make.

8.5.2 Stainless steel R

Motor	80	90S	90L	100L	112M	132S	132M	160M	160L	180M	180L	200L	225S	225M	250M	280S	280M
CB	ta (*)																
25-125	491	513	537	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-160	521	543	567	611	637	-	-	-	-	-	-	-	-	-	-	-	-
32-125	512	534	558	602	628	-	-	-	-	-	-	-	-	-	-	-	-
32C-125	512	534	558	602	628	-	-	-	-	-	-	-	-	-	-	-	-
32-160	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
32A-160	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
32C-160	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
32-200	512	534	558	602	628	706	-	834	-	-	-	-	-	-	-	-	-
32C-200	512	534	558	602	628	706	-	834	-	-	-	-	-	-	-	-	-
32-250	532	554	578	622	648	726	-	854	898	932	-	-	-	-	-		-
40C-125	512	534	558	602	628	706	-	-	-	-	-	-	-	-	-	-	-
40C-160	512	534	558	602	628	706	-	834	-	-	-	-	-	-	-	-	-
40C-200	532	554	578	622	648	726	-	854	-	-	-	-	-	-	-	-	-
40-250	532	554	578	622	648	726	-	854	898	932	-	-	-	-	-	-	-
50C-125	532	554	578	622	648	726	-	-	-	-	-	-	-	-	-	-	-
50C-160	532	554	578	622	648	726	-	854	-	-	-	-	-	-	-	-	-
50C-200	532	554	578	622	648	726	-	854	898	932	-	1060	-	-	-	-	-
50-250	557	679	603	647	673	751	-	879	923	957	-	1105	-	-	-	-	
65C-125	532	554	578	622	648	726	-	854	-	-	-		-	-	-	-	-
65C-160	542	564	588	632	658	736	-	864	908	942	-	1070	-	-	-	-	-
65C-200	542	564	588	632	658	736	-	864	908	942	-	1070	-	-	-	-	-
65A-250	-	593	617	661	687	765	803	893	937	971	1007	1119	-	1167	-	-	-
80C-160	-	589	613	657	683	761	-	889	933	967	-	1095	-	-	-	-	-
80C-200	-	594	618	662	688	766	804	894	938	972	1088	1100	1144	1168	1376	1536	1536
80-250	-	594	617	661	687	765	803	893	937	971	1007	1119	1143	1167	1395	1555	1555
80A-250	-	594	617	661	687	765	803	893	937	971	1007	1119	1143	1167	1395	1555	1555
100-160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100C-200	-	-	-	662	688	766	804	894	938	972	-	1100	-	1168	1376	1536	-
100C-250	-	-	-	676	702	780	818	908	952	986	-	1134	-	1182	1410	1570	1570
125-125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
125-250	-	-	-	676	702	780	818	908	952	986	1022	1134	-	-	-	-	-
125-315	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150-125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150-160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150-200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150-250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200-160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200-200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
250-200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(*): Motor length based on DIN 42677, could be different due to applied motor make

8.6 Dimension vt

Motor	132S	132M	160M	160L	180M	180L	200L	225S	225M	250M	280S	280M
CB	vt											
25-125	-	-	-	-	-	-	-	-	-	-	-	-
25-160	-	-	-	-	-	-	-	-	-	-	-	-
32-125	-	-	-	-	-	-	-	-	-	-	-	-
32C-125	-	-	-	-	-	-	-	-	-	-	-	-
32-160	230	-	-	-	-	-	-	-	-	-	-	-
32A-160	230	-	-	-	-	-	-	-	-	-	-	-
32C-160	230	-	-	-	-	-	-	-	-	-	-	-
32-200	230	-	279	-	-	-	-	-	-	-	-	-
32C-200	230	-	279	-	-	-	-	-	-	-	-	-
32-250	218	-	267	267	280	-	-	-	-	-	-	-
40C-125	230	-	-	-	-	-	-	-	-	-	-	-
40C-160	230	-	279	-	-	-	-	-	-	-	-	-
40C-200	230	-	279	-	-	-	-	-	-	-	-	-
40-250	218	-	267	267	280	-	-	-	-	-	-	-
50C-125	230	-	-	-	-	-	-	-	-	-	-	-
50C-160	230	-	279	-	-	-	-	-	-	-	-	-
50C-200	230	-	279	279	292	-	304	-	-	-	-	-
50-250	218	-	267	267	280	-	312	-	-	-	-	-
65C-125	218	-	267	-	-	-	-	-	-	-	-	-
65C-160	218	-	267	267	280	-	292	-	-	-	-	-
65C-160*	228	-	277	277	290	-	302	-	-	-	-	-
65C-200	218	-	267	267	280	-	292	-	-	-	-	-
65C-200*	228	-	277	277	290	-	302	-	-	-	-	-
65A-250	220	220	269	269	282	282	314	-	340	-	-	-
80C-160	218	-	267	267	280	-	292	-	-	-	-	-
80C-160*	228	-	277	277	290	-	302	-	-	-	-	-
80C-200	233	233	282	282	295	295	307	353	353	372	394	394
80-250	220	220	269	269	282	282	314	354	340	379	401	401
80A-250	220	220	269	269	282	282	314	354	340	379	401	401
100-160	221	-	270	270	283	-	295	-	-	-	-	-
100C-200	221	221	270	270	283	-	295	-	341	360	382	-
100C-250	220	220	269	269	282	-	314	-	340	379	401	401
125-125	218	-	267	-	-	-	-	-	-	-	-	-
125-250	220	220	269	269	282	282	314	-	-	-	-	-
125-315	226	226	275	275	288	288	300	-	-	-	-	-
150-125	205	-	-	-	-	-	-	-	-	-	-	
150-160	221	221	270	270	283	-	295	--	341	360	-	-
150-200	221	221	270	-	-	-	-	-	-	-	-	-
150-250	212	212	261	261	274	274	-	-	-	-	-	-
200-160	205	205	254	-	-	-	-	-	-	-	-	-
200-200	205	205	254	254	267	267	299	-	-	-	-	-
250-200	212	212	261	261	274	274	306	-	-	-	-	-

* stainless steel

8.7 Weight

	Weight [kg] excluding motor								
	Motor								
CB	80 90S 90L	100L 112M	132 S/M	160 M/L	180 M/L	200 L	225 S/M	250 M	280 S/M
25-125	27	-	-	-	-	-	-	-	-
25-160	29	29	-	-	-	-	-	-	-
32-125	27,5	27,5	-	-	-	-	-	-	-
32C-125	27,5	27,5	-	-	-	-	-	-	-
32-160	31	31	32,5	-	-	-	-	-	-
32A-160	31	31	32,5	-	-	-	-	-	-
32C-160	31	31	32,5	-	-	-	-	-	-
32-200	38,5	40	41	43,5	-	-	-	-	-
32C-200	38,5	40	41	43,5	-	-	-	-	-
32-250	54,5	54,5	55,5	57,5	57,5	-	-	-	-
40C-125	26	26	28,5	-	-	-	-	-	-
40C-160	32	32	33,5	36,5	-	-	-	-	-
40C-200	40,5	42	43	45,5	-	-	-	-	-
40-250	55,5	55,5	56,5	58,5	58,5	-	-	-	-
50C-125	27	27	29,5	37	-	-	-	-	-
50C-160	34,5	34,5	35,5	38,5	-	-	-	-	-
50C-200	40,5	41,5	43	45,5	45,5	50	-	-	-
50-250	53,5	53,5	54,5	56,5	56,5	61,5	-	-	-
65C-125	33	33	35,5	43	-	-	-	-	-
65C-160	38,5	38,5	40	43	43	46,5	-	-	-
65C-200	46	47	48,5	51	51	55,5	-	-	-
65A-250	59	59	60	62	62	67	68	-	-
80C-160	46,5	46,5	47,5	50,5	50,5	54	-	-	-
80C-200	58,5	60	61	63,5	63,5	68	68	75	75
80-250	67,5	67	68,5	70,5	70,5	75,5	76,5	82,5	82,5
80A-250	67,5	67	68,5	70,5	70,5	75,5	76,5	82,5	82,5
100-160	71,5	72,5	74	76,5	76,5	81	-	-	-
100C-200	71	72	73,5	76	76	80,5	80,5	87,5	87,5
100C-250	87,5	87,5	88,5	90,5	90,5	95,5	96,5	102,5	102,5
125-125	62,5	62,5	64	67	-	-	-	-	-
125-250	108,5	108	109,5	111,5	111,5	116,5	-	-	-
125-315	-	-	135	137	137	139	-	-	-
150-125	105	106	107,5	-	-	-	-	-	-
150-160	86,5	87,5	89	91,5	91,5	96	96	103	-
150-200	87	88	89,5	92	-	-	-	-	-
150-250	-	-	144	146	146	-	-	-	-
200-160	144	145	146,5	149	-	-	-	-	-
200-200	141	141	142	144	144	149	-	-	-
250-200	-	-	190	192	192	197	-	-	-

9 Parts

9.1 Ordering parts

9.1.1 Order form

You can use the order form included in this manual for ordering parts.

When ordering parts always quote the following data:

1 Your **address**.

2 The **quantity, the item number and the description** of the part.

3 The **pump number**. The pump number is stated on the label on the cover of this manual and on the type plate of the pump.

4 In the event of different electric motor voltage you should state the correct voltage.

9.1.2 Recommended spare parts

Parts marked with a * are recommended spare parts.

9.2 Pump with shaft sealing M1

9.2.1 Sectional drawing

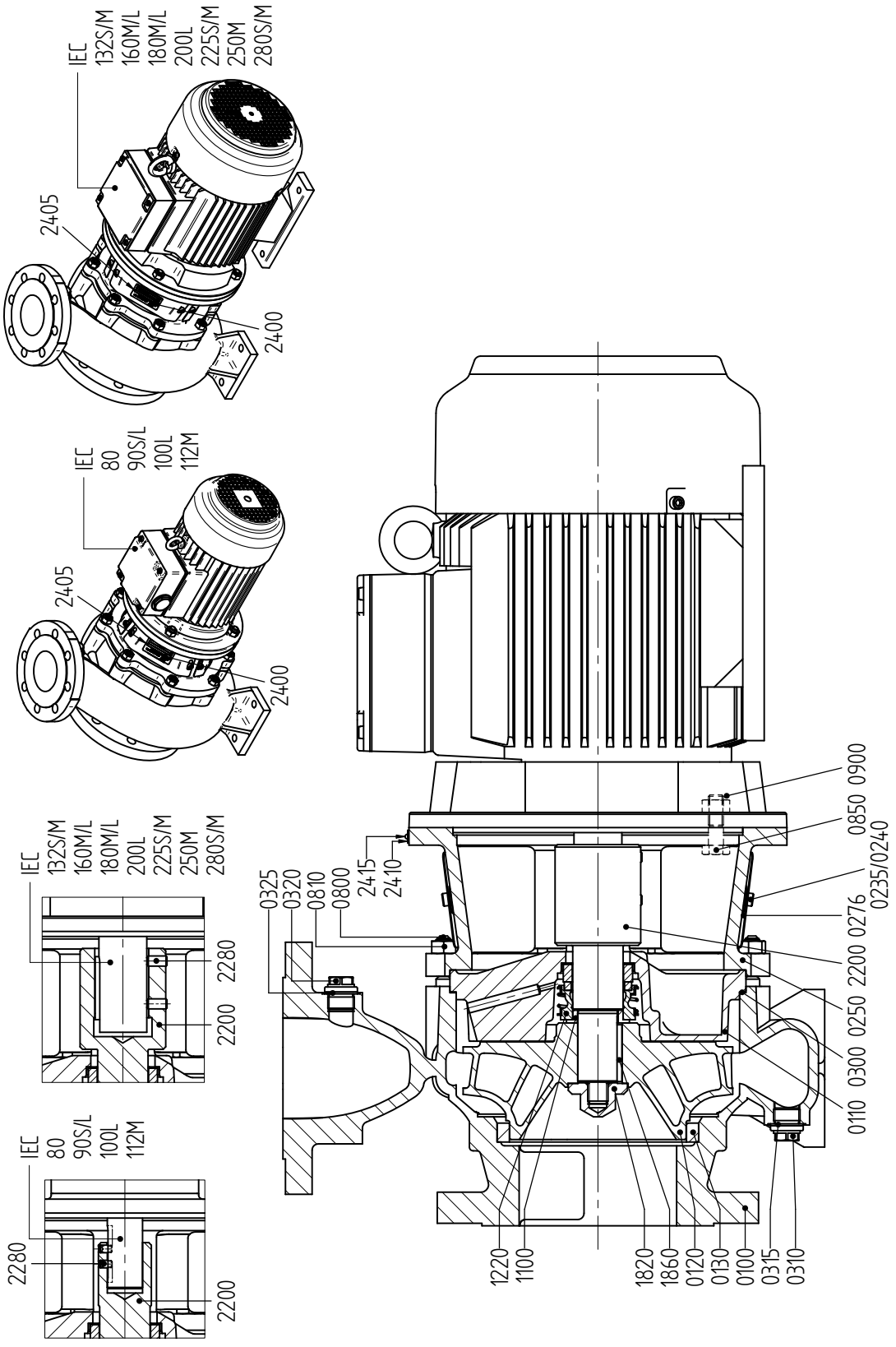


Figure 17: Sectional drawing.

9.2.2 Parts list

Item	Quantity	Description	Materials				
			G1	G2	G6	B2	R6
0100	1	pump casing	cast iron			bronze	st.st.
0110	1	pump cover	cast iron			bronze	st.st.
0120*	1	impeller	c.i.	bronze	st.st.	bronze	st.st.
0130*	1	wear ring	c.i.	bronze	st.st.	bronze	st.st.
0235	8	bolt	stainless steel				
0240	8	washer	stainless steel				
0250	1	lantern piece	cast iron				
0276	4	seal guard	stainless steel				
0300*	1	gasket	- -				
0310	1	plug	steel			bronze	st.st.
0315	1	sealing ring	not applicable				PTFE
0320	1	plug	steel			bronze	st.st.
0325	1	sealing ring	not applicable				PTFE
0800	4/8/12 *)	stud	steel			stainless steel	
0810	4/8/12 *)	nut	steel			stainless steel	
0850	4/8 **)	bolt	steel				
0900	4/8 **)	nut	steel				
1100	1	distance sleeve	stainless steel				
1220*	1	mechanical seal	- -				
1820*	1	cap nut	stainless steel				
1860*	1	impeller key	stainless steel				
2200*	1	stub shaft	stainless steel				
2280*	2	set screw	stainless steel				
2400	1	name plate	stainless steel				
2405	2	rivet	stainless steel				
2410	1	arrow plate	aluminium				
2415	2	rivet	stainless steel				

c.i. = cast iron, st.st. = stainless steel

*) Quantity depending on pump type,

**) Quantity depending on motor type

Item **0130**:
not for pumps in cast iron and bronze (G1, G2, G6 and B2), except 32-250, 65-250, 80-200, 80-250, 100-160, 100-200, 100-250, 125-250, 125-315, 150-160, 150-200, 150-250, 200-200 and 250-200.

9.3 Pump sizes 25-125 and 25-160 with shaft sealing M1

9.3.1 Sectional drawing

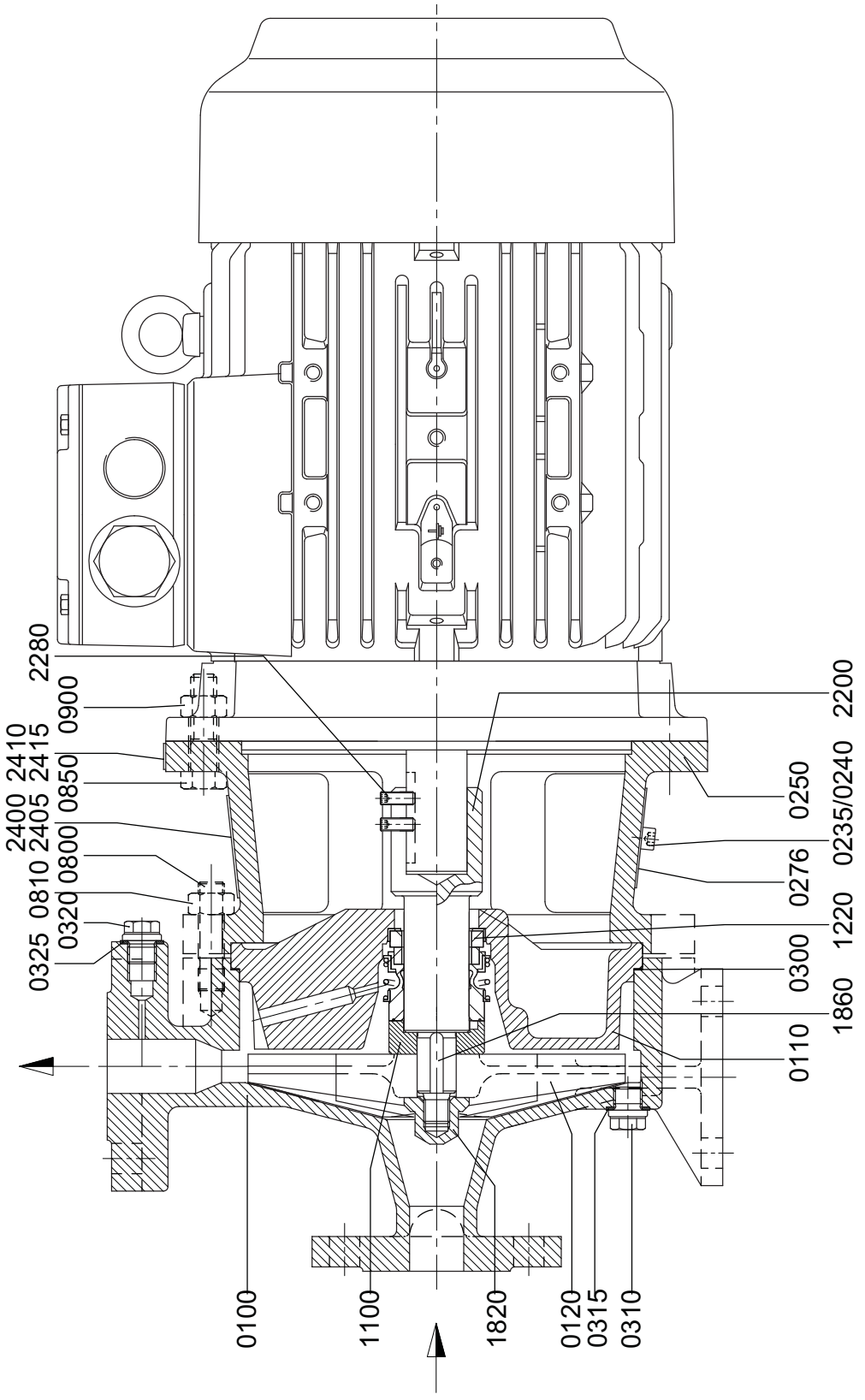


Figure 18: Sectional drawing 25-125, 25-160.

9.3.2 Parts list

Item	Quantity	Description	Materials	
			G1A	R6A
0100	1	pump casing	cast iron	stainless steel
0110	1	pump cover	cast iron	stainless steel
0120*	1	impeller	cast iron	stainless steel
0235	8	bolt	stainless steel	
0240	8	washer	stainless steel	
0250	1	lantern piece	cast iron	
0276	4	seal guard	stainless steel	
0300*	1	gasket	- -	
0310	1	plug	steel	stainless steel
0315	1	sealing ring	copper	PTFE
0320	1	plug	steel	stainless steel
0325	1	sealing ring	copper	PTFE
0800	4	stud	steel	
0810	4	nut	steel	
0850	4	bolt	steel	
0900	4	nut	steel	
1100	1	distance sleeve	stainless steel	
1220*	1	mechanical seal	- -	
1820*	1	cap nut	stainless steel	
1860*	1	impeller key	stainless steel	
2200*	1	stub shaft	stainless steel	
2280*	2	set screw	stainless steel	
2400	1	name plate	stainless steel	
2405	2	rivet	stainless steel	
2410	1	arrow plate	aluminium	
2415	2	rivet	stainless steel	

9.4 Additional parts of pump size 200-160

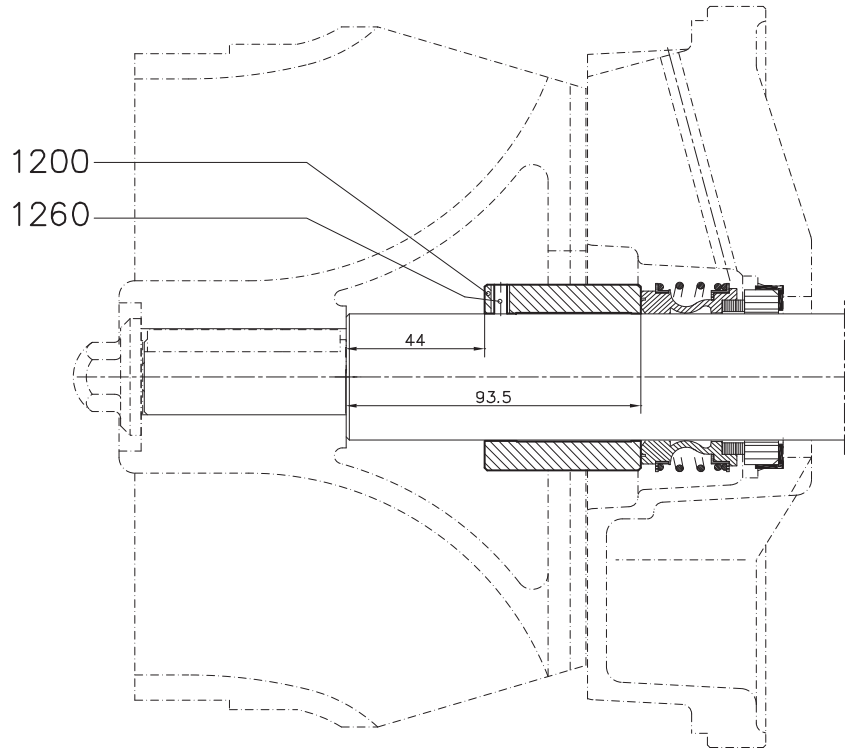


Figure 19: Shaft sleeve of 200-160.

Item	Quantity	Description	Materials		
			G1	G2	B2
1200	1	shaft sleeve	brass		
1260	3	set screw	stainless steel		

10 Technical data

10.1 Recommended locking liquids

Table 9: Recommended locking liquids.

Description	Locking liquid
cap nut (1820)	Loctite 243
wear ring (0130)	Loctite 641

10.2 Tightening moments

10.2.1 Tightening moments for bolts and nuts

Table 10: Tightening moments for bolts and nuts.

Materials	8.8	A2, A4
Thread	Tightening moment [Nm]	
M6	9	6
M8	20	14
M10	40	25
M12	69	43
M16	168	105

10.2.2 Tightening moments for cap nut

Table 11: Tightening moments for cap nut (1820).

Size	Tightening moment [Nm]
M12 (bearing bracket 1)	43
M16 (bearing bracket 2)	105
M24 (bearing bracket 3)	220

10.3 Maximum allowable speed

Table 12: Maximum allowable speed

CB	Max. speed [min^{-1}]	Bearing group
25-125	3600	0
25-160	3600	0+
32-125	3600	1
32C-125	3600	1
32-160	3600	1
32A-160	3600	1
32C-160	3600	1
32-200	3600	1
32C-200	3600	1
32-250	3000	1
40C-125	3600	1
40C-160	3600	1
40C-200	3600	1
40-250	3000	1
50C-125	3600	1
50C-160	3600	1
50C-200	3600	1
50-250	3000	1
65C-125	3600	1
65C-160	3600	1
65C-200	3600	1
65A-250	3000	2
80C-160	3600	1
80C-200	3600	2
80-250	3000	2
80A-250	3000	2
100-160	3600	2
100C-200	3000	2
100C-250	3000	2
125-125	1800	1
125-250	1800	2
125-315	1800	3
150-125	1800	1
150-160	1800	2
150-200	1800	2
150-250	1800	3
200-160	1800	2V
200-200	1800	2
250-200	1800	3

10.4 Maximum allowable working pressures

Table 13: Maximum allowable working pressure [bar]

Materials	[bar]
25-125	6
100-160	
125-125	
150-125	
150-160	
150-200	
150-250	
200-160	
200-200	
250-200	
25-160 R	8
all other	10

Test pressure: 1,5 x max. working pressure.

10.5 Hydraulic performance

10.5.1 Performance overview cast iron and bronze pumps G, B

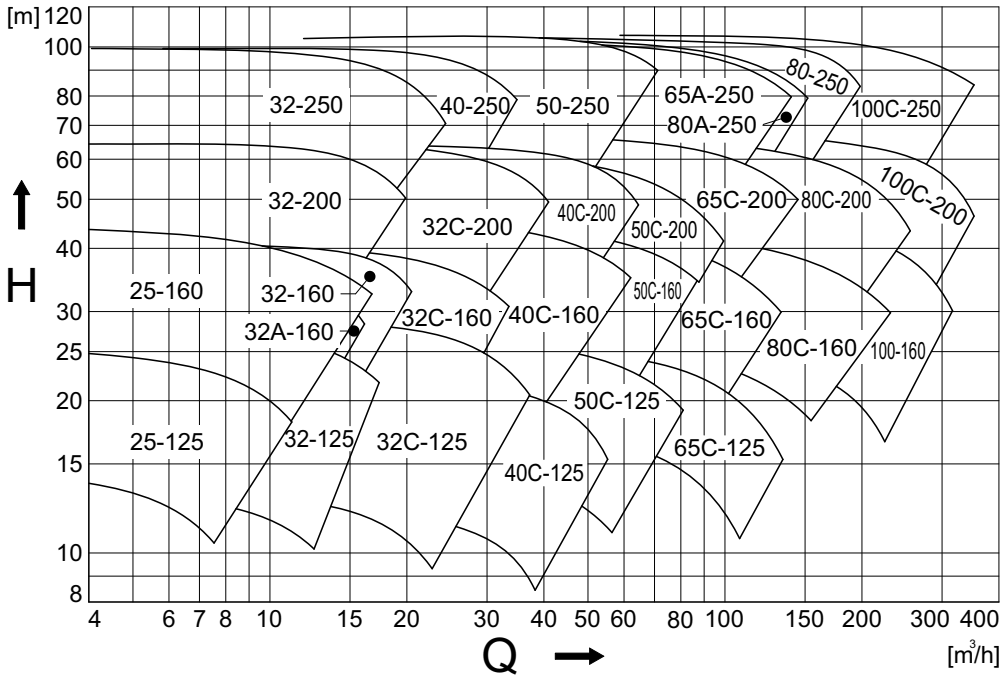


Figure 20: Performance overview 3000 min^{-1}.

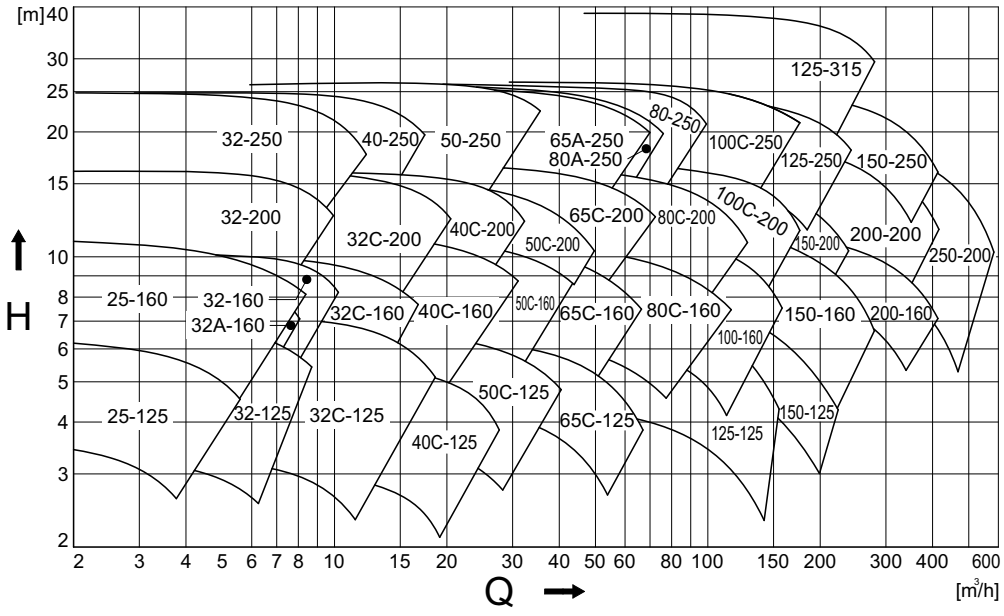


Figure 21: Performance overview 1500 min^{-1}.

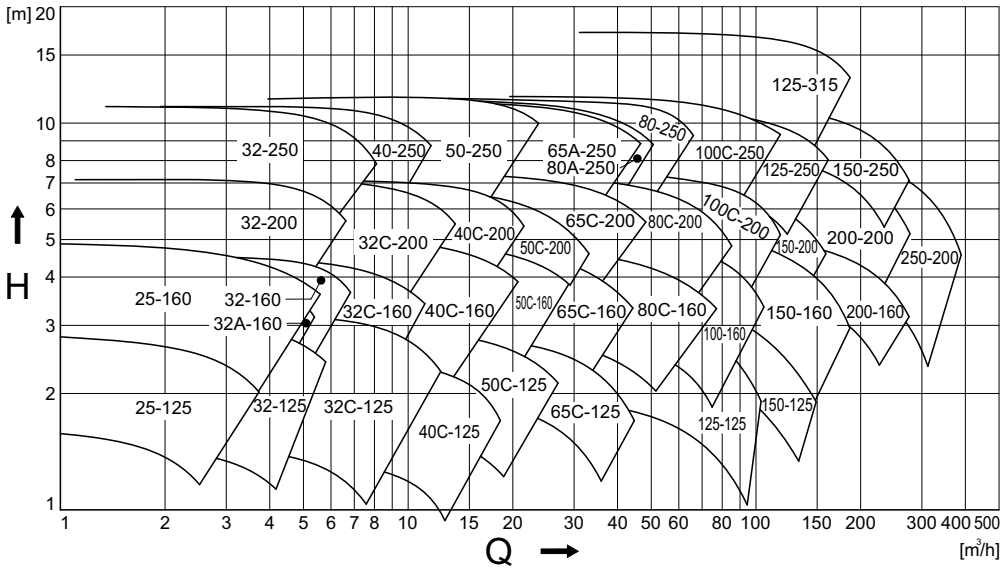


Figure 22: Performance overview 1000 min^{-1}.

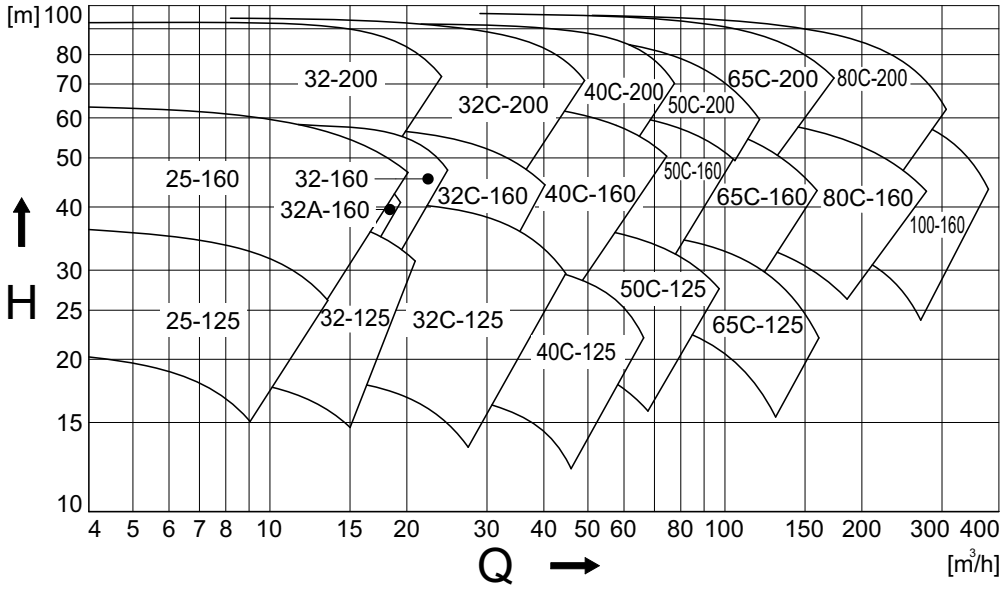


Figure 23: Performance overview 3600 min^{-1}.

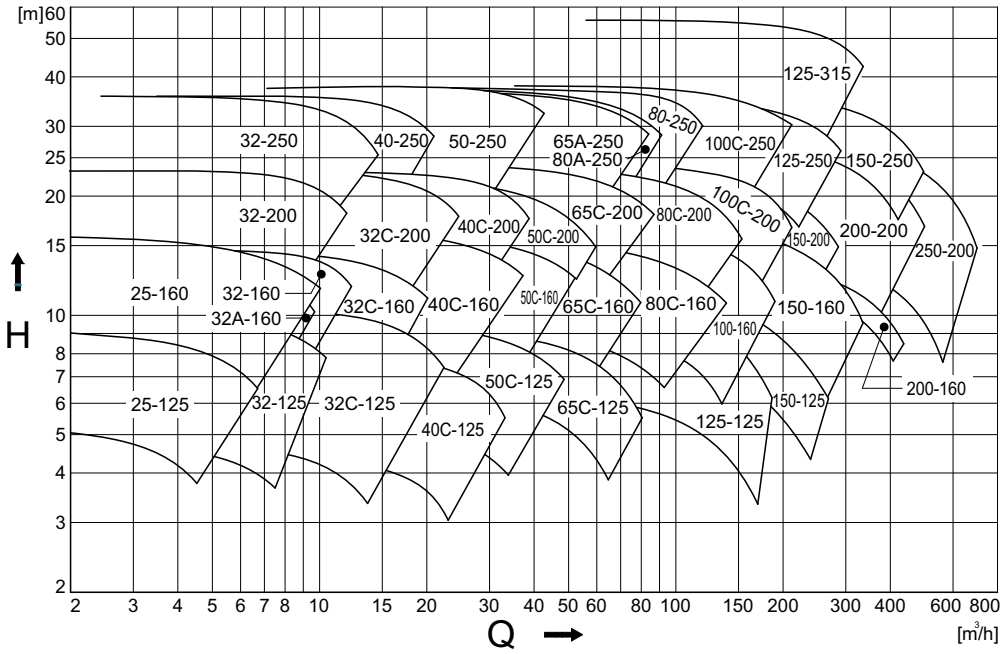


Figure 24: Performance overview 1800 min^{-1}.

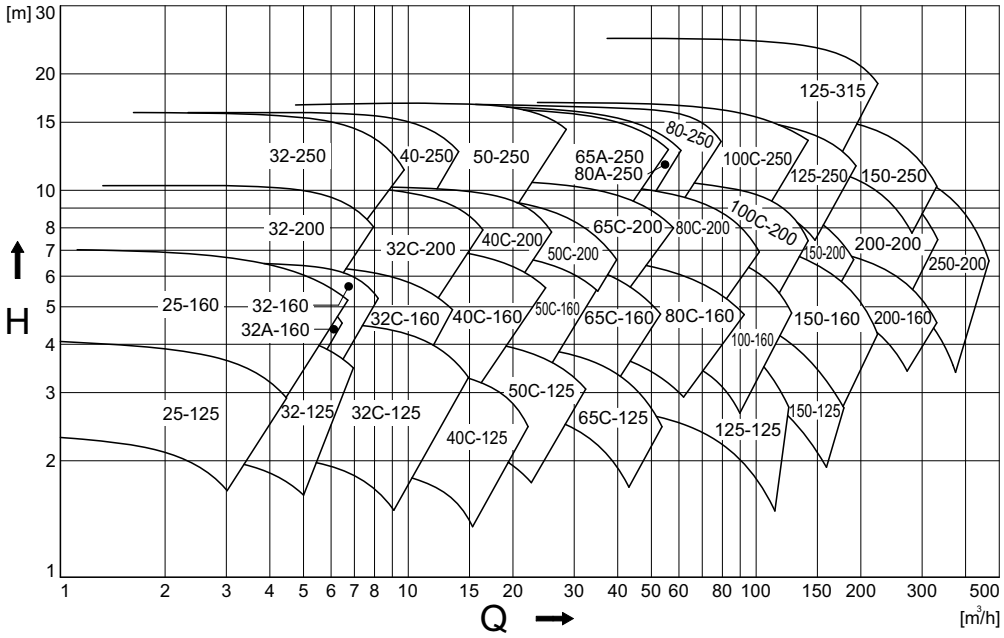


Figure 25: Performance overview 1200 min^{-1}.

10.5.2 Performance overview stainless steel pumps R

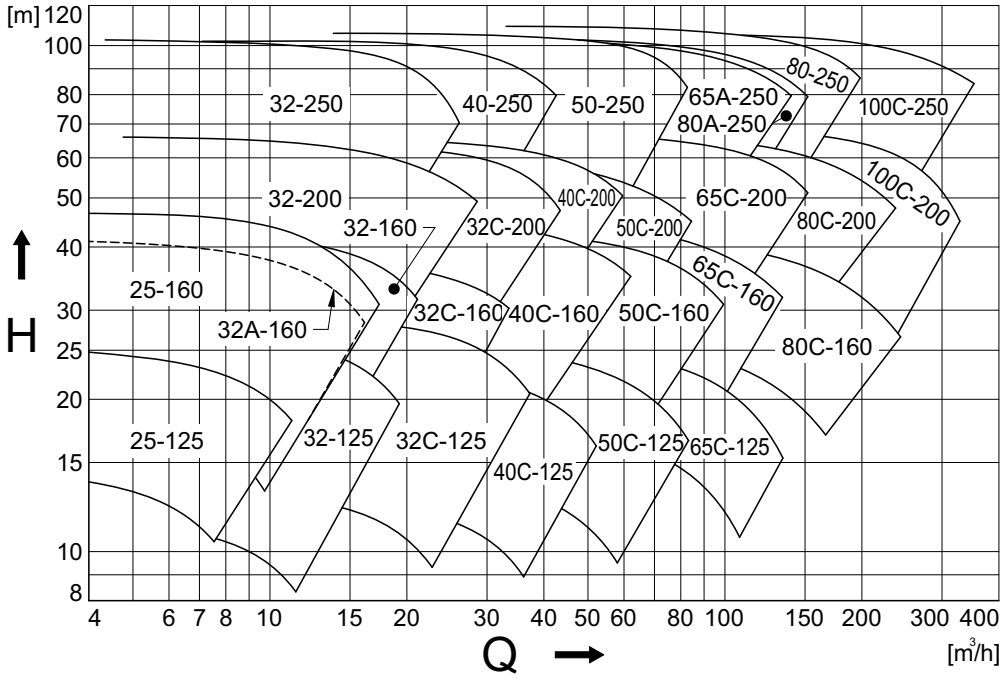


Figure 26: Performance overview 3000 min^{-1}.

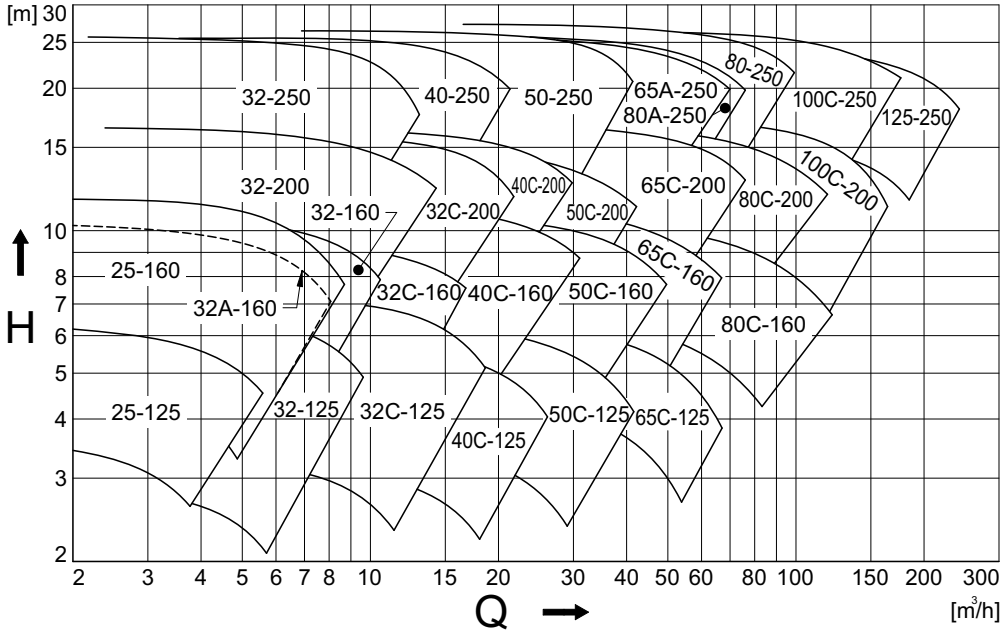


Figure 27: Performance overview 1500 min^{-1}.

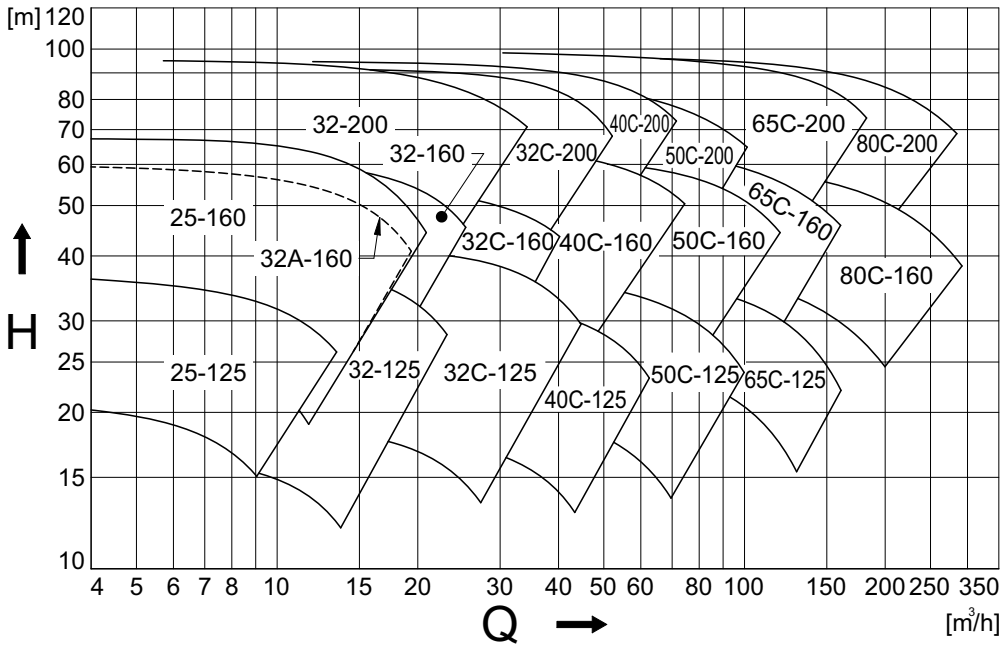


Figure 28: Performance overview 3600 min^{-1}.

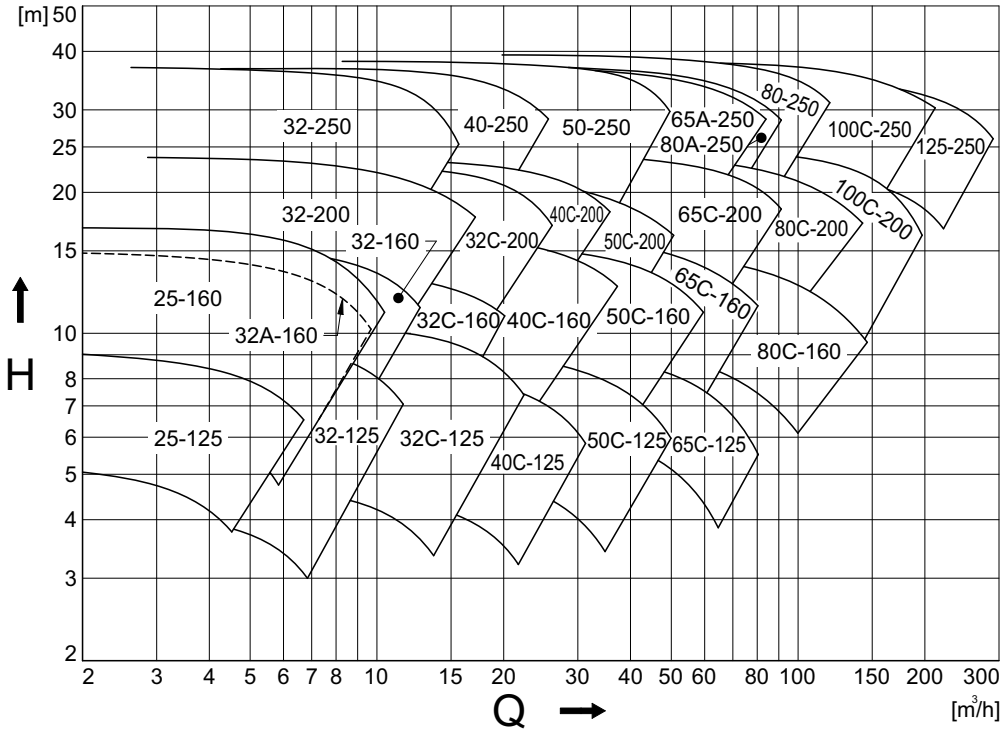


Figure 29: Performance overview 1800 min^{-1}.

10.6 Permitted forces and torques on the flanges, based on EN-ISO 5199

Forces and moments acting on the pump flanges due to pipe loads can cause misalignment of the pump, deformation and overstressing of the pump casing, or overstressing of the fixing bolts between the pump and the baseplate.

The values can be applied simultaneously in all directions with positive or negative signs, or separately on each flange (suction and discharge).

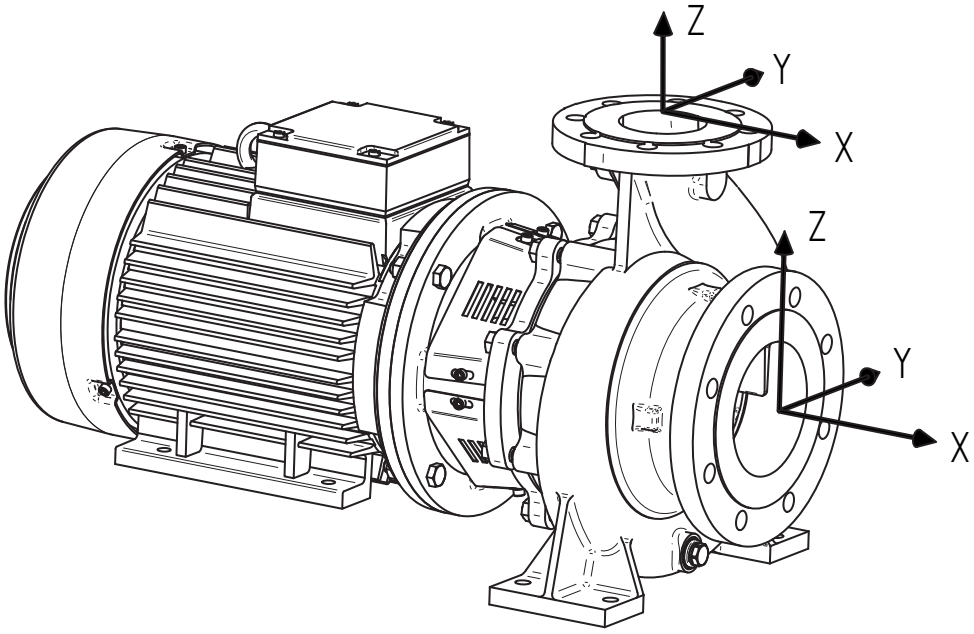


Figure 30: Coordinate system.

10.6.1 Cast iron and bronze pumps

Table 14: Permitted forces and torques on the flanges, **for cast iron and bronze pump casings**.

CB	Pump unit rigid mounted															
	Horizontal Pump, End branch, x-Axis								Horizontal Pump, Top branch, z-Axis							
	Force (N)				Moment (N.m)				Force (N)				Moment (N.m)			
	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
25-125	315	298	368	578	263	298	385	560	245	298	263	455	210	245	315	455
25-160	263	245	298	455	210	245	315	455	245	298	263	455	210	245	315	455
32-125	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32C-125	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32-160	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32A-160	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32C-160	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32-200	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32C-200	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
32-250	525	473	578	910	350	403	490	718	298	368	315	578	263	298	385	560
40C-125	648	595	735	1155	385	420	525	770	350	438	385	683	315	368	455	665
40C-160	648	595	735	1155	385	420	525	770	350	438	385	683	315	368	455	665
40C-200	648	595	735	1155	385	420	525	770	350	438	385	683	315	368	455	665
40-250	648	595	735	1155	385	420	525	770	350	438	385	683	315	368	455	665
50C-125	648	595	735	1155	385	420	525	770	473	578	525	910	350	403	490	718
50C-160	648	595	735	1155	385	420	525	770	473	578	525	910	350	403	490	718
50C-200	648	595	735	1155	385	420	525	770	473	578	525	910	350	403	490	718
50-250	648	595	735	1155	385	420	525	770	473	578	525	910	350	403	490	718
65C-125	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
65C-160	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
65C-200	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
65A-250	788	718	875	1383	403	455	560	823	595	735	648	1155	385	420	525	770
80C-160	1050	945	1173	1838	438	508	613	910	718	875	788	1383	403	455	560	823
80C-200	1050	945	1173	1838	438	508	613	910	718	875	788	1383	403	455	560	823
80-250	1050	945	1173	1838	438	508	613	910	718	875	788	1383	403	455	560	823
80A-250	1050	945	1173	1838	438	508	613	910	718	875	788	1383	403	455	560	823
100-160	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1838	438	508	613	910
100C-200	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1838	438	508	613	910
100C-250	1243	1120	1383	2170	525	665	735	1068	945	1173	1050	1838	438	508	613	910
125-125	1243	1120	1383	2170	525	665	735	1068	1120	1383	1243	2170	525	665	735	1068
125-250	1575	1418	1750	2748	613	718	875	1278	1120	1383	1243	2170	525	665	735	1068
125-315	1575	1418	1750	2748	613	718	875	1278	1120	1383	1243	2170	525	665	735	1068
150-125	1575	1418	1750	2748	613	718	875	1278	1418	1750	1575	2748	613	718	875	1278
150-160	1575	1418	1750	2748	613	718	875	1278	1418	1750	1575	2748	613	718	875	1278
150-200	1575	1418	1750	2748	613	718	875	1278	1418	1750	1575	2748	613	718	875	1278
150-250	2100	1890	2345	3658	805	928	1138	1680	1418	1750	1575	2748	613	718	875	1278
200-160	2100	1890	2345	3658	805	928	1138	1680	1890	2345	2100	3658	805	928	1138	1680
200-200	2100	1890	2345	3658	805	928	1138	1680	1890	2345	2100	3658	805	928	1138	1680
250-200	2980	2700	3340	5220	1260	1460	1780	2620	2700	3340	2980	5220	1260	1460	1780	2620

10.6.2 Stainless steel pumps

Table 15: Permitted forces and torques on the flanges, **for stainless steel pump casings**.

CB	Pump unit rigid mounted															
	Horizontal Pump, End branch, x-Axis								Horizontal Pump, Top branch, z-Axis							
	Force (N)				Moment (N.m)				Force (N)				Moment (N.m)			
	F_y	F_z	F_x	ΣF	M_y	M_z	M_x	ΣM	F_y	F_z	F_x	ΣF	M_y	M_z	M_x	ΣM
25-125	630	595	735	1155	525	595	770	1120	490	595	525	910	420	490	630	910
25-160	525	490	595	910	420	490	630	910	490	595	525	910	420	490	630	910
32-125	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
32C-125	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
32-160	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
32A-160	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
32C-160	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
32-200	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
32C-200	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
32-250	1050	945	1155	1820	700	805	980	1435	595	735	630	1155	525	595	770	1120
40C-125	1295	1190	1470	2310	770	840	1050	1540	700	875	770	1365	630	735	910	1330
40C-160	1295	1190	1470	2310	770	840	1050	1540	700	875	770	1365	630	735	910	1330
40C-200	1295	1190	1470	2310	770	840	1050	1540	700	875	770	1365	630	735	910	1330
40-250	1295	1190	1470	2310	770	840	1050	1540	700	875	770	1365	630	735	910	1330
50C-125	1575	1435	1750	2765	805	910	1120	1645	945	1155	1050	1820	700	805	980	1435
50C-160	1575	1435	1750	2765	805	910	1120	1645	945	1155	1050	1820	700	805	980	1435
50C-200	1575	1435	1750	2765	805	910	1120	1645	945	1155	1050	1820	700	805	980	1435
50-250	1575	1435	1750	2765	805	910	1120	1645	945	1155	1050	1820	700	805	980	1435
65C-125	2100	1890	2345	3675	875	1015	1225	1820	1190	1470	1295	2310	770	840	1050	1540
65C-160	2100	1890	2345	3675	875	1015	1225	1820	1190	1470	1295	2310	770	840	1050	1540
65C-200	2100	1890	2345	3675	875	1015	1225	1820	1190	1470	1295	2310	770	840	1050	1540
65A-250	2100	1890	2345	3675	875	1015	1225	1820	1190	1470	1295	2310	770	840	1050	1540
80C-160	2485	2240	2765	4340	1050	1330	1470	2135	1435	1750	1575	2765	805	910	1120	1645
80C-200	2485	2240	2765	4340	1050	1330	1470	2135	1435	1750	1575	2765	805	910	1120	1645
80-250	2485	2240	2765	4340	1050	1330	1470	2135	1435	1750	1575	2765	805	910	1120	1645
80A-250	2485	2240	2765	4340	1050	1330	1470	2135	1435	1750	1575	2765	805	910	1120	1645
100C-200	2485	2240	2765	4340	1050	1330	1470	2135	1890	2345	2100	3675	875	1015	1225	1820
100C-250	2485	2240	2765	4340	1050	1330	1470	2135	1890	2345	2100	3675	875	1015	1225	1820
125-250	3150	2835	3500	5495	1225	1435	1750	2555	2240	2765	2485	4340	1050	1330	1470	2135

10.7 Noise data

10.7.1 Pump noise as a function of pump power

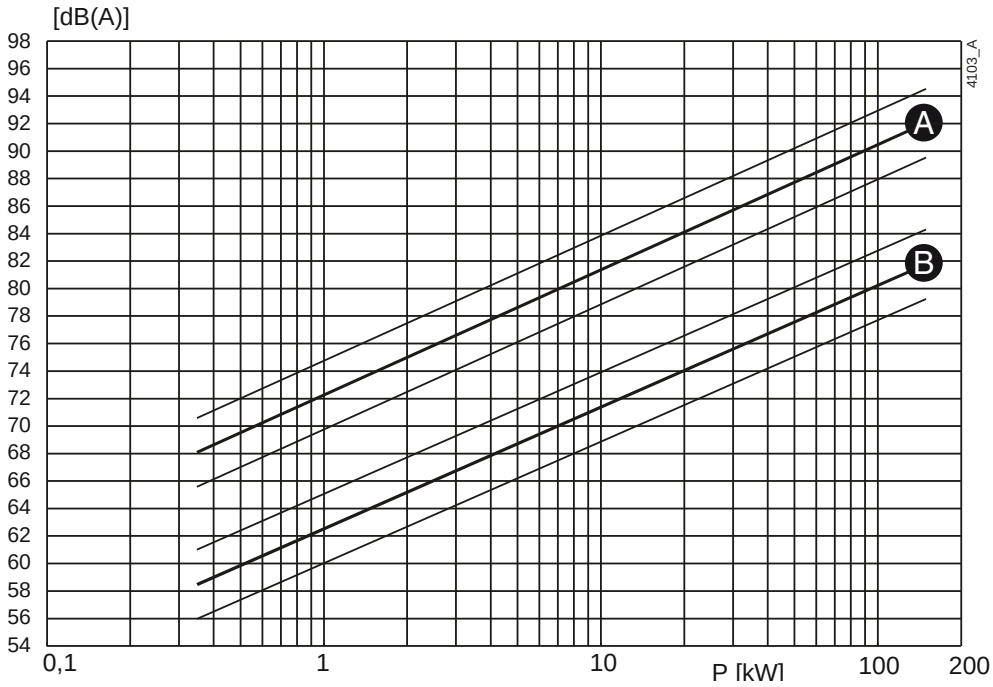


Figure 31: Noise level as function of pump power [kW] at 1450 min^{-1}
A = sound power level, B = sound pressure level.

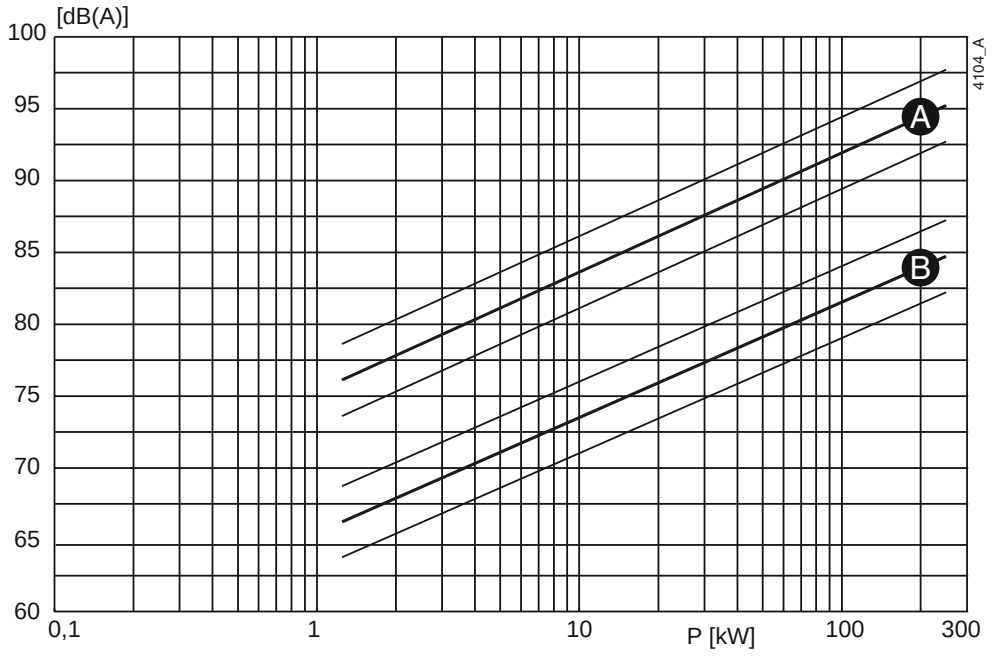


Figure 32: Noise level as function of pump power [kW] at 2900 min^{-1}
A = sound power level, B = sound pressure level.

10.7.2 Noise level of entire pump unit

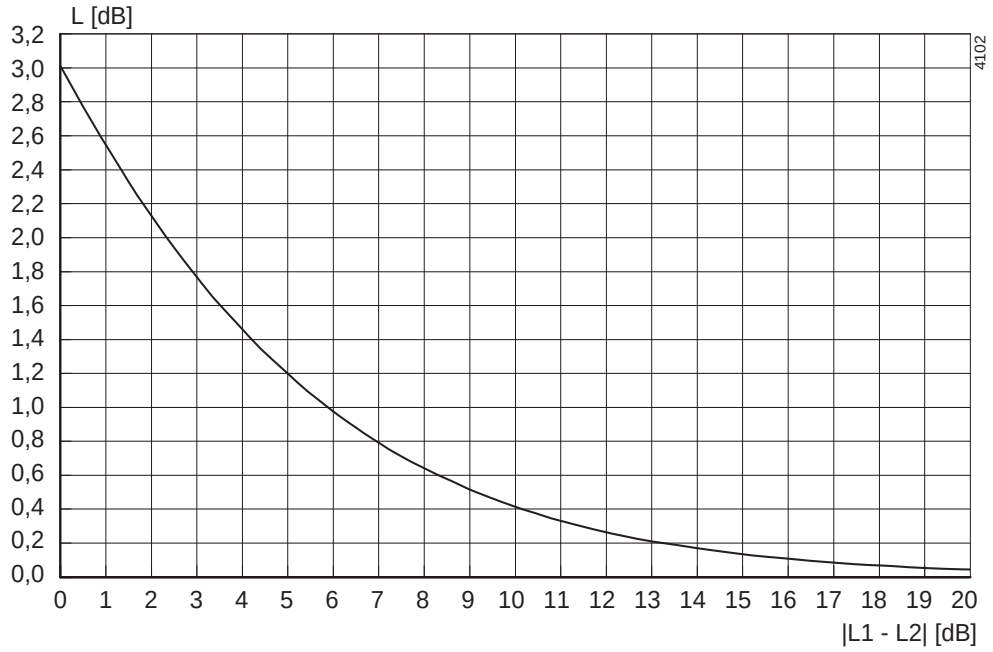


Figure 33: Noise level of entire pump unit.

In order to determine the total noise level of the entire pump unit, the noise level of the motor must be added to that of the pump. This can be easily done by using the graph above.

1 Determine the noise level (L1) of the pump, see figure 31 or figure 32.
2 Determine the noise level (L2) of the motor, see documentation of the motor.
3 Determine the difference between both levels |L1 - L2|.
4 Find the differential value on the |L1 - L2|-axis and go up to the curve.
5 From the curve go left to the L[dB] -axis and read out the value.
6 Add this value to the highest value of both noise levels (L1 or L2).

Example:

1 Pump 75 dB; motor 78 dB.
2 |75-78| = 3 dB.
3 3 dB on the X-axis = 1,75 dB on the Y-axis.
4 Highest noise level + 1,75 dB = 78 + 1,75 = 79,75 dB.

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Order form for spare parts

FAX Nr.	
ADDRESS	

Your order will only be dealt with if this order form has been correctly completed and signed.

Order date:	
Your order number:	
Pump type:	
Execution:	

Quantity	Item. No.	Part	Article number pump

Delivery address:	Invoicing address:

Ordered by:	Signature:	Telephone:

CombiBloc

Horizontal centrifugal monobloc pump

WHERE IDEAS MEET INDUSTRY

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